

Exploring diet and food system indicators through data mapping

Aregash Samuel^{*1}, Masresha Tessema¹ and Alebel B. Weldesilassie²

¹Ethiopian Public Health Institute (EPHI), ²Policy Studies Institute

**Corresponding author: Aregash Samuel, email: aregash.ephi@gmail.com*

Abstract

Background: Data mapping is a useful resource that enables health and nutrition actors to implement policy, programs and research outputs effectively.

Objective: The overall objective of this study was to identify and determine the accessibility of existing data sources on healthy and sustainable diets in Ethiopia for further analysis.

Method: This study assessed the availability and accessibility of nutrition-related data using different techniques, including document review and analysis of secondary data and primary data.

Results: This study identified a total of 48 data sources from potentially relevant reports. The most significant periodic nutrition-related data collection systems in Ethiopia are the Ethiopia Demographic and Health Survey and Household Consumption Expenditure Survey by Central Statistics Agency (CSA) and nutrition surveys by Ethiopian Public Health Institute. Majority of the data (n=5 out of 8); which are nationally and regionally representative were collected by CSA. Most of the datasets included in this study were surveys (n=21 out of 48) and some of them were evaluations of programs (n=12 out of 48). Most of the datasets (64.5%) were accessible upon request. The majority of the data sets (n =24 out of 48) were conducted at the program implementation *woreda* level. Children under five years of age had more presence in the data sources compared to other groups. Minimum meal frequency, minimum dietary diversity, and minimum acceptable diet were the most available indicators among the nutrition intervention indicators. The amount of fruits and vegetables produced was the indicator most collected in agricultural indicators. Among water, sanitation, and hygiene indicators, the proportion of households with improved drinking water supply was collected the most. The forthcoming survey is expected to capture most indicators related to agriculture.

Conclusions: This study revealed that datasets are accessible upon request, however, data gaps are prevalent in developing countries, with diet-related data scarce. It underscores the importance of future surveys prioritizing agricultural indicators to improve understanding of Ethiopia's nutrition landscape. Periodic monitoring of health and nutritional status is needed, especially with limited data on agro-ecological conditions.

Keywords: Data availability, Data mapping, Diet, Ethiopia, Food system, Indicators

Introduction

Unhealthy diets were reported as the second leading risk factor for death and disability-adjusted life-years (DALYs) globally in 2016 (FAO and WHO 2019). Healthy diets reduce the risks to morbidity and mortality. The challenge of achieving healthy diets is important issue to consider in an effort to attaining a sustainable food systems (Willett et al. 2019). Several actors need to be involved to achieve a sustainable food system. It is important to understand the food system's dynamics to guide decisions and select appropriate interventions. Little is known about the coverage, availability and quality of diet and food system related data in Ethiopia. Evidence generation is needed to provide recommendation that could help address the challenges towards achieving sustainable healthy diets in the country. Thus, exploring the availability of indicators that describe healthy and sustainable diet is very important in the process of understanding the necessary conditions to consider while planning for interventions.

Appropriate indicators are needed to track the progress toward the sustainability of diets and food systems at national level (Harrison et al. 2022). The food system

data mapping helps to identify important areas for development and offer insightful data for country - specific policies intended to create pathways for sustainable transformation (Carey et al. 2016). The lack of comprehensive and up-to-date data on the food system presents a significant challenge for policymakers, researchers, and other stakeholders who are working towards improving food security, sustainability, and public health (Carletto et al. 2013). Without accurate and detailed information on various aspects of the food system, such as production, distribution, consumption patterns, and waste management, it becomes difficult to identify and address critical issues, make informed decisions, and implement effective interventions (Story et al. 2009). Hence, there is a pressing need for an organized and accessible food system data mapping system.

Data mapping is a useful resource that enables health and nutrition actors to effectively implement policy, programs and research outputs. Without accurate data mapping, there is inadequate planning and resource allocation, leading to inefficient use of resources and limited impact on food security and sustainability (Ericksen et al. 2009; Ingram 2010). Data mapping can

help identify areas of food waste generation and develop initiatives to reduce waste and promote a more sustainable system (Parfitt et al. 2010; Parfitt 2010). It also aids in increasing food security by identifying areas with limited access to nutritious food and developing targeted interventions (De Souza 2013).

Comprehensive data mapping enables understanding of nutritional quality and dietary patterns, informing interventions to address deficiencies and promote better health outcomes (Fanzo 2017). Mapping data related to greenhouse gas emissions and resource depletion helps identify areas for reduction and fosters a more sustainable and climate-resilient food system (Vermeulen 2012). Overall, data mapping in the food system is crucial for effective decision-making, resource allocation, and targeted interventions to improve food security, sustainability, public health, and mitigate climate.

The Policy Studies Institute (PSI) in collaboration with Ethiopian Public Health Institute (EPHI), Wageningen University and Research (The Netherlands) and McGill University (Canada) is initiating a policy study under the project “Leveraging Systems Approach for Healthier and Sustainable Diet Policy in Ethiopia”. As a preliminary activity a data landscaping was required to explore the available diet and food system related data for further use. Thus, the objectives of this data inventory study are to identify existing data sources on healthy and sustainable diets in Ethiopia, to determine accessibility of the data for further analysis, to assess the representativeness of the data to guide the process of evidence generation for policy decision making and to identify gaps for further data need towards healthy and sustainable diets.

Materials and Methods

Concept note preparation and document review:

Concept note was developed and reviewed, and consensus was reached on the way forward. Following this criteria were designed to select relevant data from existing sources. The main points used include; data representativeness in terms of geography (national level, regions covered in the study, and rural Vs urban), agro-ecology (pastoral/ non-pastoral), economic/income group, vulnerable group; availability of suitable indicators for nutrition outcome variables and other variables describing the demographic and socioeconomic characteristics and have potential effects to nutrition were considered.

After incorporating the feedback on the concept note and discussing on the inclusiveness of the identified criteria for the data search, the first step executed was to search for related reports with indicators on diet and food system for mapping suitable indicators towards

food systems and healthier diets. Thus, a preliminary document review was conducted to assess relevant sectors and organizations working on nutrition. Based on the search, a list of priority sectors and stakeholders was prepared (Supplemental file 1).

Intensive document search was done to obtain reports and supporting data sources from the priority sectors and organizations identified. Reports, review documents, available dashboards and food and nutrition related websites were explored. Following this relevant documents and available data mapping, reports were reviewed vigorously. The list of documents reviewed is available in Supplemental file 1. The document review process comprised extracting the variables, indicators and related information included in the reports and dashboards (2020). Then, these were categorized under broader group/domain. The document review exercise also included description of indicators, data management system and other information that help to properly map the data. In addition, for this exercise a secondary data was secured from the National Information Platform for Nutrition (NIPN) at the Ethiopian Public Health Institute (EPHI) for further analysis (NIPN/EPHI, 2021). The data was cleaned and further analyzed to suit the purpose. Afterwards a new dataset was prepared organizing the extracted data/ indicators collected from different sources.

Identification of relevant indicators: After documents searching, indicators suitable for the objective of the study were listed and organized. The domains used to organize the indicators are; nutrition interventions and anthropometric indicators, infant and young child feeding indicators, agricultural indicators, WASH indicators, post-harvest indicators, economic indicators, diet-related indicators, and food system indicators.

Data types: The plan was to collect data on the survey, multiple indicator cluster surveys (MICS), other nationally representative surveys, routine monitoring, impact assessment, operational research and other related health and nutrition data and data-related information. In addition, global and national survey data were secured.

Data processing: Indicators collected from secondary data and primary data were compiled. All the data were entered to an Excel sheet. Data analysis was carried out using SPSS (Version 22.0 for Windows, IBM, New York, USA) and simple tables and graphs were prepared to illustrate the results.

Results

Data mapping for healthy and sustainable diets in

Ethiopia: Data mapping is a useful approach to

effectively utilize available evidence and identify the gaps for data need. The main healthy diet-related data providers in Ethiopia are: Central Statistics Agency (CSA), research institutions (EPHI, Ethiopian Institute of Agricultural Research (EIAR), and Policy Studies Institute) and monitoring and evaluation units of line ministries (Ministry of Health (MoH), Ministry of Agriculture (MoA), Ministry of Water, Irrigation and Energy (MWIE)), non-governmental research and development organization International Food Policy Research Institute (IFPRI), Save the children, Alive and Thrive, Nutrition International), and UN organizations such as Food and Agricultural Organization (FAO) and United Nation Children's Fund (UNICEF).

In the data mapping exercise, two types of major data collection systems were identified: routine and periodic data. The most significant periodic nutrition-related data collection systems in Ethiopia are the Ethiopia Demographic and Health Survey (DHS)(EPHI and ICF 2019) and data collected by EPHI such as the National Food Consumption Survey (NFCS)(EPHI, 2013). This study collected data sources from a list of 48 potentially relevant reports. Only three of them were from routine data sources namely health management information system (HMIS) and online partnership management system- Sequota from MoH; and ONE WASH Phase 2 Baseline report from Ministry of Water, Irrigation and Energy (MWEI). The list of reports and dashboards identified and reviewed is found in Supplemental file 1. International and national guidelines and reports on food system including Global Nutrition Report were also considered in this review. In addition to the reports, document reviewed included data mapping reports by different offices such as Alive and Thrive (A and T 2020; NIPN/EPHI 2021). Documentations prepared by the different technical working groups including the Sustainable Food System Indicators for Ethiopia Report(Chege et al. 2021), prepared by the food system technical working group, was also included.

The guide used to review the documents is found in Supplemental file 2. Supplemental file 3 provides list of indicators included in the data mapping exercise. The list includes nutrition interventions and anthropometric indicators (19), infant and young child feeding (IYCF) indicators (2), agricultural indicators (17), water, sanitation and hygiene (WASH) indicators (11), post-harvest indicators (3), economic indicators (11), diet-related indicators (15), and food system indicators (35). Except for the 'Young Lives study', which is a 15 years follow-up study conducted since 2002 by Policy Studies Institute, the rest of the data cover the period from 2010-2020. Data Sources for the

indicators described in Supplemental file 3 are listed in Supplemental file 4. Definitions of mostly used indicators are described in Supplemental file 5. The results of this study are categorized and presented as: socio-demographic characteristics of the dataset, level of representativeness, data availability and accessibility, data quality control mechanisms applied, indicators, and gaps for further data need.

Socio-demographic characteristics of the data set:

Assessment of variables describing the socio-demographic and socio-economic characteristics was done. The presence of variables that explain heterogeneity (such as age, gender, family size, wealth, marital status, religion, education level, etc) were checked. Most of the global reports comprise categories such as age, target groups, and description by wealth status. National datasets from CSA have description of data by household, family size, gender, age (a group of category), religion, ethnic group, marital status, level of education, employment status, wealth quintile, place of residence etc. Table 1 describes the age group category included in the data sources.

Table 1: Age group description

S.No	Age category (n=48)	F
1	Age category given	6
	Specific age group addressed	
2	1 year and 8 year age	1
3	Children under 2 years age	10
4	Children under 3 years age	2
5	Children under 5 years age	12
6	Adolescents	1
7	Not Applicable*	3
8	Only age of the head of household was given	2
9	Not given	11

F=frequency, n=number, *Not applicable means the data is a market survey data

Target groups and major descriptors identified in the datasets:

The distribution of target groups in the data sets was assessed. Descriptors include households, farmer producer price, market survey, fruits and vegetables, and grains. The fruits and vegetables value chain study addressed potato, tomato, mango and banana. The grain crop value chain study assessed sorghum, maize, wheat and barley. The social groups described include children under 2 years of age, children under 5 years of age, adolescents, pregnant women, lactating women and women of reproductive age. Target groups for the 'Young Lives study' were children who are 1 year of age and 8 years of age. Figure 1 describes the target group and descriptors shown in the reports. Most of the data were described at household level (n=10). The primary target group is children under 5 and under 2 years of age.

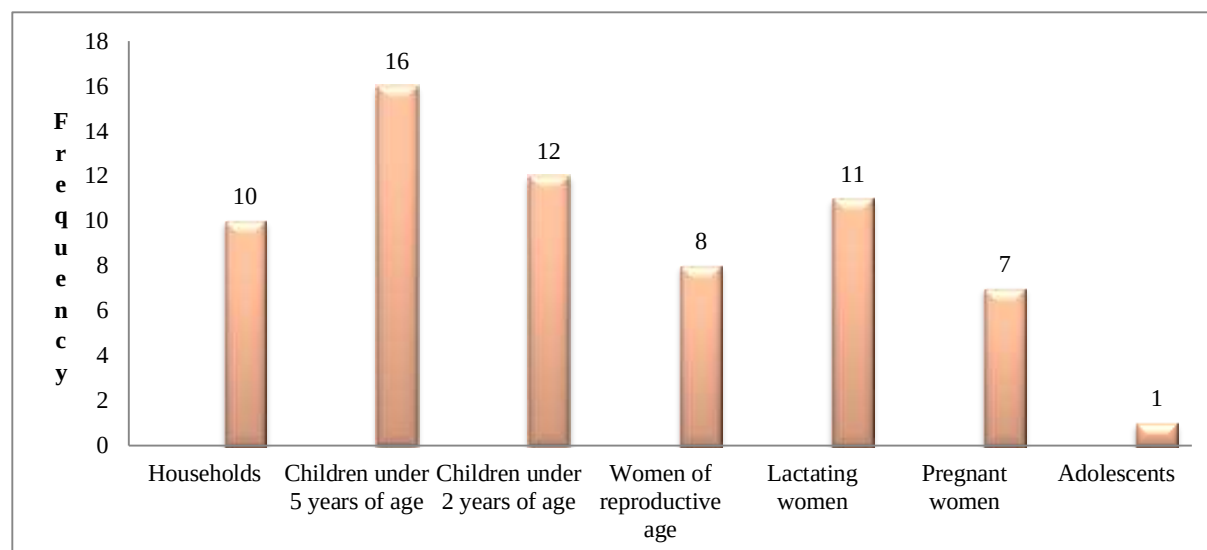


Figure 1: Target groups and descriptors in the dataset

Level of representativeness of the data: Table 2 describes level of representativeness of the 48 datasets included in this study. Only about a quarter of the data identified (n=11 out of 48) were national-level datasets. Half (n=24 out of 48) of the data sets were conducted at the program implementation *woreda* level. Majority of the data (n=5 out of 8); which were nationally and regionally representative were conducted by the Central Statistics Agency (CSA). Data on crop and livestock product utilization conducted by CSA was the only dataset that was representative at national, regional and zonal levels. Routine monitoring data from HMIS of Ministry of Health (MoH) and the weekly public health emergency management (PHEM) surveillance tracking data provided national, regional, zonal, and *woreda* level data.

Table 2: Representativeness of the data

	Representativeness of the data (n=48)	n
1	National level *	10
2	Regional level	3
3	National and regional level	7
4	National, regional, zonal and <i>woreda</i> level	2
5	National, regional, and zonal level	1
6	Program implementation <i>woreda</i>	24
7	No information about representativeness	1

n=number; *Two of the data sources are from Global Nutrition Report comparing Ethiopia status with other regions in the world.

Regarding the nature of the data, most of the datasets were surveys (n=21 out of 48), and a quarter of the data were from evaluation of programs (n=12 out of 48).

Data availability and accessibility: Data mapping includes information on the accessibility of data for use. It also describes whether the datasets are found in

Excel, or STATA, or SPSS for analysis. Data accessibility further indicates whether the data is accessible upon request or open access or with restricted access or not accessible at all. Most of the datasets (64.5%) are accessible upon request. Only about a quarter (25.8%) has open access.

Data quality control mechanisms: Different methods were employed to ensure data quality. These include the availability of description of sampling methodology employed; the tools used for data collection, providing training for data collectors, conducting a pretest, using software applications and in rare cases, a double data entry (hard copy data collection). Table 3 describes the data quality control methods employed for the datasets. Most of the datasets have a good description of the sampling methodology (88.9%) of the study undertaken. More than 80% had conducted pre-test and pilot survey before the actual data collection was undertaken.

Table 3: Data quality control methods employed to the data sets

Data quality control methods used (n=29)	n (%)
Description of sampling methodology	26 (96.3)
Training of survey team	21 (77.8)
Pre- test and pilot survey conducted	22 (81.5)
Field checklist used for quality assurance	11 (40.7)
Data entry program used	15 (55.6)
Double entry to check the consistency	1 (3.7)

n=number

Indicators: The table below describes the availability of data across different datasets. As it can be seen from Table 4, there are many indicators that look similar, but they are not comparable. This calls for harmonization of indicators across sources to maximize the use of the data. Harmonized indicators need a clear operational definition.

Table 4: Availability of data across the identified datasets

Indicators	n (%)
Nutrition intervention and anthropometric indicators	
1 Prevalence of stunting among children under five	16 (14)
2 Prevalence of underweight among children under five	14 (12)
3 Prevalence of wasting among children under five	16 (14)
4 Prevalence of anemia among children 6 – 59 months	1 (1)
5 Prevalence of low birth weight among children under five	5 (4)
6 Prevalence of low BMI among women	5 (4)
7 Prevalence of overweight and obesity	14 (12)
8 Household dietary diversity	8 (7)
9 Individual dietary diversity	7 (6)
10 Percentage of women consuming diversified meal (> 4 food groups)	4 (4)
11 Severe Acute Malnutrition (SAM) coverage	3 (3)
12 Proportion of primary schools with school feeding program	1 (1)
13 Deworming coverage	11(10)
14 Iron folate supplement coverage	14(12)
15 Prevalence of anemia in women of productive age	3(3)
16 Coverage of presence of Iodized Salt	5(4)
17 Minimum meal frequency	17 (15)
18 Minimum dietary diversity	18 (16)
19 Child and adolescent (aged 5-19) underweight	2 (2)
IYCF indicators	
20 Prevalence of minimum acceptable diet of children 6 – 23 months	17 (15)
21 Minimum dietary diversity score of children under two years	13 (12)
Agricultural indicators	
22 Household production diversity	9 (8)
23 Yield per crop	3 (3)
24 Amount of fruits and vegetables produced	16 (14)
25 Proportion of HH with home gardens (urban or rural)	3 (3)
26 Amount of nutrient dense staple crops and pulses produced	7 (6)
27 Amount of meat produced (tons)	1 (1)
28 Amount of milk produced (liter)	4 (4)
29 Number of eggs produced	3 (3)
30 Number of additional hectares under irrigation schemes	4 (4)
31 Amount of crop consumed	4 (4)
32 Amount of fruits and vegetables consumed	5 (5)
33 Honey yield	1 (1)
34 Milk yield index	1 (1)
35 Crop yield	2 (2)
36 Crop yield index	2 (2)
37 Agricultural yield	1 (1)
38 Agricultural index	1 (1)
WASH indicators	
39 Proportion of HH with improved drinking water supply	17 (15)
40 Proportion of HH with hand washing facilities	12 (11)
41 Proportion of schools with improved water supply	4 (4)
42 Proportion of HH with access to improved latrine facilities	15 (13)
43 Proportion of HH practicing open defecation	11 (10)
44 Proportion of HH with animal cohabitation	2 (2)
45 Proportion of HH that practice safe disposal of child faeces	6 (5)
46 Drinking water coverage	2 (2)
47 Sanitation coverage	2 (2)
48 Population using at least basic sanitation services	1 (1)
49 Population using safely managed sanitation services	1 (1)
Post-harvest indicators	
50 Number of fruit and vegetable preservation technologies/practices identified and introduced	2 (2)
51 Amount of crop lost at pre and post-harvest	3 (3)
52 Amount of fruits and vegetables lost at pre and post-harvest	8 (7)

Economic indicators		
53	Food price data	5 (4)
54	Proportion of population below poverty line	5 (4)
55	Proportion of expenditures allocated for food	3 (3)
56	Population with household expenditures on health greater than 10% of total household expenditure or income (SDG 3.8.2)	1 (1)
57	Population with household expenditures on health greater than 25% of total household expenditure or income (SDG indicator 3.8.2)	1 (1)
58	Percentage of national budget allocated to nutrition	1 (1)
59	Proportion of total government spending	1 (1)
60	Consumption expenditure per capita International dollars, 2011 PPP	1 (1)
61	Proportion of household consumption spent on food and beverages Percent	1 (1)
62	Proportion of household food and beverage consumption spent on meat and fish (all households) Percent	1 (1)
63	Gini index Scale (0 - 100)	1 (1)
Diet-related indicators		
64	Percentage of total calories from non-staples	1 (1)
65	Availability of fruit and vegetables	1 (1)
66	Estimated per capita intake of fruits, vegetables, whole grains, legumes, nuts and seeds, and milk grams per day	1 (1)
67	Estimated per capita intake of sugar-sweetened beverages (SSBs), red meat, processed meat, and sodium grams per day	1 (1)
68	Mean energy intake (Kcal/d) as reported for children, women and men	1 (1)
69	Median fat intake (g/d) as reported for children, women and men	1 (1)
70	Median protein intake as reported for children, women and men	1 (1)
71	Prevalence of inadequate protein intake as reported for children, women and men	1 (1)
72	Median carbohydrate intake as reported for children, women and men	1 (1)
73	Prevalence of inadequate carbohydrate intake as reported for children, women and men	1 (1)
74	Median intake of Iron children aged 6-35 months and women of reproductive age (WRA)	1 (1)
75	Median intakes of iron, zinc and vitamin A in WRA	1 (1)
76	Prevalence of inadequate and excessive micronutrient intakes in WRA	1 (1)
77	Percentage of children aged 6-35 months, women and men consuming fortifiable wheat products	1 (1)
78	Percentage of children aged 6-35 months, women and men consuming fortifiable oil products	1 (1)
Food system indicators		
79	Annual change in use of improved cereal seeds (Ha) (data source CSA)	1 (1)
80	Change in average annual temperature (°C) (data source: FAOSTAT)	1 (1)
81	Annual Change in the number of trade agreements signed and accessions in the past decade (Data source: Ethiopian government (African Union)	1 (1)
82	Annual change in Food exports (as a % of merchandise exports) (Data source: World Bank)	1 (1)
83	Annual change in Annual urbanization rate (%) (Data source: UNDESA)	2 (2)
84	Annual change in Average population growth rate per annum (%) (Data source: UNDESA)	2 (2)
85	Food production index (2004-2006=100) (Data source: World bank)	1 (1)
86	Livestock production index (2004-2006=100) (Data source: World bank)	1 (1)
87	Change in electricity penetration in Ethiopia (Data source: World bank)	1 (1)
88	Change in Agriculture, forestry, and fishing, value added (% of GDP) (Data source: World bank)	2 (2)
89	Growth of modern grocery retailers and supermarket (%) per 100,000 population (Data source: Euromonitor International at the FS DASHBOARD)	2 (2)
90	Average dietary energy supply adequacy (%) (3-year average) (data source: FAOSTAT)	1 (1)
91	Fill the Nutrient Gap (Cost of Nutritious Diets) (data source: EPHI, 2019)	1 (1)
92	Percent population connected to a city of at least 50,000 people (1 - 3 hours access). (data source: IFPRI)	1 (1)
93	Prevalence of food related diseases (data source: Global Health Data)	1 (1)
94	Government commitment to improved Nutritional Standards (data source: EIU)	1 (1)
95	Total Food loss (data source: FAOSTAT)	1 (1)
96	Retail value of ultra-processed food sales per capita USD (data source: Euromonitor International)	2 (2)
97	Literacy rate (%) (data source: UNESCO)	1 (1)
98	Description of the population, by gender (data source WB)	1 (1)
99	Presence of taboos or believes that affect consumer choices (data source: (LSM World bank Data)	1 (1)
100	Greenhouse gas emissions (CO2 equivalent), Agriculture total (data source: FAO)	2 (2)
101	Percentage of national land area with tree cover (%) (data source: FAO)	1 (1)
102	Prevalence of undernourishment (%) (data source: FAO)	2 (2)
103	Prevalence of obesity in adults (18 years and above) (data source: FAO, EDHS)	1 (1)

104	Agriculture value added per worker (US\$, 2010 constant prices)(data source: WB)	1 (1)
105	Agriculture, forestry and fish value added as a percentage of GDP (data source: WB)	1 (1)
106	Gender equity in Agriculture (data source: WB)	2 (2)
107	Wage gap between agriculture and average wages, proportion ag to total (data source: ILOSTAT)	2 (2)
108	Share of dietary energy from cereals, roots and tubers Percent	1 (1)
109	Supply of vegetables, fruit, pulses, meat, fish, eggs and milk g/person/day	1 (1)
110	Cost of nutrient adequacy (CoNA)	1 (1)
111	Agricultural infrastructure index Score	1 (1)
112	Salt fortification legislation Status	1 (1)
113	Wheat flour fortification legislation Status	1 (1)

n=number

Gaps for further data need: Data gap is more prominent in developing countries, and diet related data are even scarce (Micha et al., 2018) and rarely collected which may even go beyond 5 to 10 years. Epidemiologic and nutrition related data need to be captured periodically to monitor progress in health and nutritional status of a population. Old data will not be relevant to provide appropriate intervention. As seen from the existing sources, timeliness of the data needs consideration. Additionally, most of the data sources reviewed lack predictive information about the target groups including religion, ethnic group, and place of residence. As dietary habits could be influenced by such factors, future data collection need to consider such variables.

One of the famous data sources for health and nutrition-related indicators is the Ethiopia Demographic and Health Survey (DHS) which is collected every five years by the CSA. Additionally, a mini DHS is collected in between the five years. This, however, is not as detailed as the EDHS. For example,

body mass index (BMI) and women dietary diversity, which are among the impact indicators of the nutritional status of women given in the National Nutrition Program (NNP II)(FDRE, 2016), were not collected in the 2019 Ethiopia Mini Demographic and Health Survey (EMDHS)(EPHI&ICF, 2019). Thus, it was not possible to track progress relating to nutritional status of women after DHS 2016. The other major gap in DHS data is the dietary diversity status of women. However, EPHI is conducting a food and nutrition strategy (FNS) baseline survey 2021, and these and many other indicators are included in this survey.

Data describing the agro-ecological (pastoralist vs agrarian) condition of the population were also limited. From the global targets and national documents like NNP, there are indicators related to a healthy life style that needs to be tracked to measure the progress. Some of the indicators relevant to this study but for which data were not found are included in Table 5.

Table 5: Indicators gaps identified across the datasets

S. No	Indicator	Possible data provider*
1	Body mass Index (BMI)	MOH/EPHI/CSA
2	Women dietary diversity	MOA/EPHI/CSA
3	Intake of processed, ultra-processed food and street foods	EPHI
4	Proportion of schools with homestead gardening	MOE
5	Proportion /Number Nutrition services delivered on communicable and non-communicable diseases	MOH
6	Number of bio-fortified crops promoted	MOA
7	Proportion of households with caged/fenced poultry production	MOA
8	Proportion of <i>woredas</i> with at least one milk collection center-supported	MOA
9	Protein supply - (crops, livestock, fish) grams/capita/per day	MOA
10	Trade negotiations that routinely assess sustainability impacts, including on food security, health, and equity	MOTI
11	As a country whether phased out use of antibiotics as growth promoters	MOA
12	Whether implementing national strategies for integrated pest management (IPM)	MOA
13	Whether as a country monitoring mortality from pesticide poisonings (intentional and unintentional)	MOA
14	Accessibility of results of environmental, social and health impact assessments conducted on agricultural policies; plans and projects to the public	MOA

15	Number of food processing technologies/practices identified and introduced	MOA
16	Number of fish preservation technologies identified and introduced	MOA
17	Nation budget per child U5 for nutrition-specific interventions	MOFEC
18	Proportion of Nutrition budget for Treatment of SAM	MOFEC
19	% of total daily energy intake from saturated fats	EPHI
20	% of total daily energy intake from protein in adults	EPHI
21	Prevalence of food borne diseases; and incidence of foodborne disease outbreaks	EPHI
22	Proportion of foods marketed (locally or cross border) that comply with international trade standards for hormone, pesticide, antibiotic residues as well as other chemical microbiological food safety parameters.	MOTI/EFDA

*Author's assumption; U5=under five years of age

Discussion

Data mapping helps to locate the existing data in order to save resources. A good data repository system is useful to preserve research output and to make dataset and findings available to the public. More importantly presence of such a functional system enables timely decision-making to improve the nutrition situation of the population. There may be basic rules and data sharing policies to access the data but the availability itself matters to determine the suitability. A nutrition information system (NIS) is a system designed to continuously collect, analyse, interpret and share nutrition-related data (Tiphaine Boulin et al., 2020). The NIS in Ethiopia needs to be strengthened and functional. It has to be inclusive of all relevant indicators. Across sectors and organizations, data usage culture needs to be encouraged. Well-organized and strengthened information systems having pertinent indicators of public health importance including food security are important elements on the journey of evidence generation.

This data mapping exercise was intended to provide comprehensive information on healthy and sustainable diet-related data sources in Ethiopia. A total of 48 data sources were identified. Just about a quarter of the data identified (n=11 out of 48) were conducted at the national level. Majority of the data (n=5 out of 8), which were both nationally and regionally representative were conducted by CSA. Most of the datasets were surveys (n=21 out of 48) and some of them were evaluation of programs (n=12 out of 48). Most of the datasets (64.5%) were accessible upon request. About a quarter (25.8%) has open access. In terms of representativeness of the data, the majority of the datasets (n =24 out of 46) were conducted at program implementation *woreda* level. However, a good number of the data were also identified at national level. Among target groups identified in the data sources, children under five years of age had more presence in the data sources compared to other groups.

Regarding the data availability, minimum meal frequency and minimum dietary diversity were the most widely collected indicators among the nutrition intervention indicators. Out of the IYCF indicators for children below 2 years of age, the prevalence of minimum acceptable diet of children 6 – 23 months of age was collected the most. The amount of fruits and vegetables produced was the indicator that was collected most among agricultural indicators. Among WASH indicators, proportion of households with improved drinking water supply was collected the most.

ENGINE birth cohort study conducted by Save the Children had maximum number of indicators (n=32). However, this study was conducted at program, *woreda*, level, and the data is not accessible. The current report on The Sustainable Food System Indicators for Ethiopia (Chege et al., 2021) comprises very large number of indicators (n=30) with the links for the data sources. The Food system dashboard (Food Systems Dashboard - Diets and Nutrition) also contains large number of indicators at national level (n=29). Among datasets provided by CSA, demographic and health survey (DHS) has a good number of indicators (n=19) representative at the national and regional level (ICF&CSA, 2016). The current data mapping report by NIPN/EPHI (NIPN/EPHI, 2021) also show that DHS is the most reliable nationally representative data source to measure progress towards global (Mannar et al., 2020) and NNP-II targets (FDRE, 2016). Most of the indicators needed to be captured in the coming survey are shown to be from MoA. To provide evidence towards healthy and sustainable diets, the identified gaps in different components of food system need to be addressed in future studies.

Regarding to data-sharing mechanism employed by sectors and organizations, existing studies indicated the lack of data-sharing policies and guidelines among institutions (A&T, 2020). However, EPHI and UNICEF were the only organizations that reported having a guideline and policy document. The benefits of working towards an effective data sharing system reward all in

the long run and also contribute to a sustainable food system in general.

Strength of the study: The study has mapped out food system indicators in Ethiopia based on recent data.

Limitations of the study: The study mainly focused on secondary data, but a thorough metadata and data check were drawn on to ensure the quality of information collected. In addition, most of the data were collected long time ago; for instance, 5 or 10 years before. It is, hence, worth nothing that recent data are required to adequately describe the current situation. Livelihood representation of the datasets collected for this study could be considered as another limitation.

Conclusions

The multiple burden of malnutrition is a growing concern for developing countries like Ethiopia. Malnutrition cannot be effectively managed by only one sector. This calls for a coordination among different sectors and institutions to effectively address food and nutrition issues. Resources are limited; on the other hand, data demand is growing in Ethiopia, and it is well known that information gap slows the progress achieved in reducing malnutrition. More importantly, there is a high expectation from decision-makers that policies and programs need to be evidence-based. Researchers are also suggesting developing the metrics for sustainable diets and food systems to guide the policy choices, similar to what was done with the Millennium Development Goals and the multi-dimensional Poverty Index (Fanzo et al., 2012). Therefore, it is important to encourage data providers to establish a system that captures and archives data safely and to monitor trends of achievements towards the global and nationally set targets.

Promotion of a healthier diet is important to address the problems of the triple burden of malnutrition. Thus, planning a sustainable and equitable healthy food system is essential to ensure healthy and nutritious diets for all. For that, it is important to explore the food system's dynamics including the dietary gaps and dietary transitions to assess their contribution and influence on the system (Gebru et al., 2018). To realize this, it is important to have integration of methods from different disciplines and employ innovative analytical approaches to better understand the food system and nutrition issues and, thus, inform decision makers (Dangour et al., 2017).

Proper and timely analysis of data requires a coordinated data securing and archiving system. In addition to NIS, NIPN Ethiopia is also working towards having a central data repository by preparing a 1) codebook, 2) dataset documentation and metadata for the dataset. This codebook describes the tool used for

data collection. The dataset documentation and metadata describe important issues including the geographic coverage, study design, sample and sampling procedures, method of data collection, data quality control used before and during data collection, level of representativeness and data accessibility. The ultimate goal of NIPN repository is to link to the National Data Management Center for health situated at EPHI.

Integration of available national and subnational databases both from public and international sources would help feed timely information and provide base to strengthen the food system approach ensuring a healthier diet for consumers (Gebru et al., 2018, Carletto et al., 2013).

The following recommendations could be drawn from the present study:

- ✓ The analyses and results are only as good as the quality of the data collected. Data quality matters; thus, accurate data and information, timely data for timely response need to be encouraged;
- ✓ It is highly recommended to gather information on the identified data gaps. Most of the data lack livelihood representation and comparisons for several indicators; for example, addressing agro-pastoral vs pastoral areas. It is important to ensure such representation to design appropriate intervention. Description of rural vs urban area was made mainly for the national surveys conducted by CSA and EPHI. In addition, some of the datasets that were gathered by projects did not even show regional representation. Diet related indicators could be influenced by ethnic differences; such kind of datasets is needed to provide evidence for intervention.
- ✓ Improve data awareness to promote proper data use at all levels, and promote nutrition data use by fostering data use culture among ministries and organizations;
- ✓ Encourage data providers to provide datasets to the central repository to make the nutrition-related data more accessible and functional;
- ✓ Create a strong information system with improved data capturing mechanism in all line ministries and research centers to capture indicators helpful for tracking progress in food system;
- ✓ Create a system that makes repositories responsible/accountable to monitor and update data flow regularly;
- ✓ Strengthen the monitoring and evaluation (M&E) system of sector offices to improve data quality;
- ✓ Data providers are advised to prepare or adapt a data sharing policy and guideline; and

- ✓ Support the use of innovative analytical approaches to provide the food system with robust and timely evidences.

Competing interests

The authors declare that they have no competing interests.

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