Conference on 'Nutrition dynamics in Africa: opportunities and challenges for meeting the sustainable development goals'

Optimising design and cost-effective implementation of future pan-African dietary studies: a review of existing economic integration and nutritional indicators for scenario-based profiling and clustering of countries

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Most of the African countries are undergoing a complex nutrition and epidemiologic transition associated with a rapid increase in the prevalence of diverse non-communicable diseases. Despite this alarming situation, the still limited and fragmented resources available in Africa impede the implementation of effective action plans to tackle the current and projected diet–disease burden. In order to address these common needs and challenges, the African Union is increasingly supporting continental approaches and strategies as reflected in the launching of the Agenda 2063 and the African regional nutrition strategy 2015–2025, among others. To assure the successful implementation of pan-African nutritional and health initiatives, cost-effective approaches considering similarities/disparities in economy, regional integration, development and nutritional aspects between countries are needed. In the absence of pre-existing models, we reviewed regional economic integration and nutritional indicators (*n* 13) available in international organisations databases or governmental agencies websites, for fifty-two African countries. These indicators were used to map the countries according to common languages (e.g. Arabic, English, French, Portuguese), development status (e.g. human development index), malnutrition status (e.g. obesity) and diet (e.g. staples predominantly based on either cereals or tubers). The review of the indicators showed that there exist similarities between African countries that can be exploited to benefit the continent with cross-national experiences in order to avoid duplication of efforts in the implementation of future pan-African health studies. In addition, including present and future nutrition surveillance programmes in Africa into national statistical systems might be cost-effective and sustainable in the longer term.

Africa: Study design: Indicators: Dietary intake: Data mining

Most of the African countries are currently undergoing a rapid nutrition transition characterised by a shift from the traditional diets rich in fibres and complex carbohydrates, towards an increased intake of animal proteins, as well as high-energy dense foods rich in hydrogenated and saturated fats, salt and refined sugar[1–3]. Concomitantly to this nutrition transition is an epidemiologic transition characterised by an escalating prevalence of obesity and non-communicable diseases such as CVD, respiratory diseases, diabetes and some types of cancers[4,5]. Paradoxically, micronutrient deficiencies are still drastically prevalent in most African countries[6]. The double burden of malnutrition which encompasses the coexistence of nutritional deficiencies together with overweight

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and obesity is placing greater pressure on the fragile health system of most African countries[7].

Despite this alarming situation, the still limited and fragmented resources allocated to nutrition in African countries hinder the implementation of effective action plans to address the current and forecasted diet–disease burden. Concernedly it has been reported that the investments in nutrition are imbalanced when compared to the increase in the challenges due to the nutrition transition tentacles which are hampering the efficient and continuous allocation of the investments[8]. While considering the tremendous economic and social burden due to malnutrition in all its forms within Africa, there is a need for established food and nutrition research, monitoring and surveillance systems as powerful tools for policy makers, researchers, risk assessors, health actors and the private sector to understand, monitor and better prevent the current global diet-related diseases, mostly in the vulnerable population groups. Otherwise, there is a need for more concerted and sustained actions at country, regional and continental level in order to 'end hunger, achieve food security and improved nutrition' as ambitioned in the sustainable development goals[9]. The African Union is advocating for better health and nutrition and the improvement of the quality of the life of African populations in the recently launched Agenda 2063[10,11] and the African regional nutrition strategy[12].

To assure the successful implementation of these initiatives and other current or future pan-African health and nutritional ones, cost-effective approaches considering similarities/disparities in economy, regional integration, development and nutritional aspects between countries are needed. Moreover, there is a need to inventory at a country level the socio-economic and health indicators susceptible to influence the nutrition situation of the population. These indictors could serve for several purposes including grouping the countries according to similarities, for example, by using cluster analysis. Cluster analysis is extensively used in economic and financial studies to group countries by development status and to identify vulnerable or advanced nations in order to recommend appropriate actions according to the level of development[13–15]. Cluster analysis has also been used in public health for diverse purposes, for example, for clustering countries for the implementation of water and sanitation projects[16].

In the present paper, we perform across African countries (*n* 52), an inventory of existing economic integration (e.g. human development index, languages) and nutritional (e.g. incidence of malnutrition, nutrition networks) indicators susceptible to impact the design and implementation of pan-African nutrition action plans in the food and health domains (e.g. dietary assessment, food safety, programme implementation, water and sanitation). Firstly, the importance of the implementation of nutrition monitoring and surveillance programmes in Africa especially in the context of the nutrition transition is outlined. Secondly, the potential of regional economic integration in addressing common nutritional challenges and the relevance of efficient allocation of resources in the resource-constrained environment often found throughout Africa is reviewed. Thirdly, economic integration and nutritional indicators were inventoried and mapped for visualisation. Fourthly and finally, possible lessons from other regions of the world, particularly the GloboDiet initiative for dietary data collection in Europe is presented.

Importance of nutrition monitoring and surveillance for Africa

Nutrition monitoring and surveillance is a regular or continuous follow-up of the nutritional status of a population in order to take decisions for improving the nutrition and health of that population[17]. In low- and middle-income countries and particularly in Africa, the term had been confined to anthropometry in household and community food security routine surveys usually incorporated in broader demographic and health surveys[18]. The anthropometric approach is cost-effective and efficient in addressing nutritional issues in a nutritional landscape dominated by child and maternal malnutrition, hunger and micronutrient deficiencies (particularly within the 1000 d window of opportunity)[19]. This was particularly conclusive for the assessment of the progresses in the millennium development goals by measuring progress towards the reduction of hunger, stunting and wasting, and consequently morbidity and mortality in women at childbearing age and children aged 5 years or less.

Notwithstanding the common use in low- and middle-income countries, in its broader definition, nutrition monitoring and surveillance encompasses food availability, clinical assessment, food and nutritional biomarkers analysis, body composition and the assessment of dietary intake, in addition to anthropometric measurements and water and sanitation aspects. The current double burden of malnutrition and the nutrition transition require the inclusion of the multiple aspects of the nutrition monitoring and surveillance in order to better prevent the diet-related non-communicable diseases trends across Africa[20]. Ethiopia[21], Nigeria[22] and South Africa[23] have already conducted a national food consumption survey in adults within recent years and could serve as examples. Interestingly, the South African nutrition survey was further embedded into a broader national health survey (National Health and Nutrition Examination Survey), which included physical examination, cardiovascular fitness and blood lipids testing.

Potential of regional integration in Africa

Previous studies have reported several obstacles affecting the effectiveness of nutritional interventions in Africa and concluded in a lack and inefficient allocation of financial and human resources, their weak coordination or at a broader extent, inadequate strategising[24,25]. In addition, while transferring successful experiences from pilot countries or regions to others, several parameters regarding the specificity of the implementation fields

Table 1. Indicators to profile African countries

Indicators	Definition	
Economic integration indicators		
Regional integration	Supra-national clusters that maintain the sovereignty of the countries but allows for/facilitates cooperative policies with other countries	1. UN geographical regions Data source: UNO (2013) Rationale: Countries sharing the same supranational UN cluster 2. Membership of regional groupings (ECOWAS, COMESA, ECCAS, AMU, CEMAC, SACU, SADC, EAC) Data source: AU (2016) Rationale: countries in the same regional integration bodies have ratified short- and long-term common policy in diverse areas
Languages	Official, *Lingua franca* and local languages	3. Official and local languages Data source: CIA World Fact (2016) Rationale: countries sharing the same official, Langua franca or local transboundary languages have common integration poles (e.g. Francophonie, Commonwealth)
National human development	Level of the economic development, education and lifespan	4. Human development index Data source: UNDP (2016) Rationale: the state of development relates to the possibility of the country to mobilise internal financial and trained human resources for project implementation
Statistical capacity	Data-gathering capacity of each country, and membership of international statistical consortia	5. Statistical capacity indicator Data source: World Bank (2015) 6. Implementation status of the national strategy for the development of statistics Data source: AU (2012), Paris 21(2016) Rationale: level of statistical capacity is linked to the recurrence and the quality of data collected nationally
Nutritional and diet-related indicators		
Incidence of malnutrition	Prevalence of undernutrition and overnutrition at a country level	7. Underweight (BMI $< 15\cdot5$ kg.m^{-2}) Data source: NCD risk factor collaboration consortium(2016) 8. Overweight and obesity (BMI $> 24\cdot9$ kg.m^{-2}) Data source: NCD risk factor collaboration consortium(2016) Rationale: the type of malnutrition in the country might determine the objective and the type of dietary surveillance to be implemented
Nutrition and dietetics networks	Organisation of nutritionists and dietitians into a national society, and/or participation of the country representatives into continental nutrition networks	9. Existence of a nutrition or a dietetic society Data source: IUNS (2012), ICDA (2012), ANS (2016) 10. Participation in the AS-PADAM network Data source: AS-PADAM network (2014) Rationale: the existence of these networks is useful for bold advocacy and for leadership role at country-level
Dietary assessment	Data regarding food consumption patterns and established food quality assessment	11. WHO-FAO food consumption cluster Data source: FAO-WHO GEMS cluster (2012) 12. Implementation of a food safety programme Data source: WHO (2012), national food quality agencies (2016) 13. National dietary intake survey previously conducted Data source: databases (PubMed, Web of Science, Scopus, Google Scholar; 2016) Rationale: dietary and food quality assessment are premises to experience in dietary exposure

ANS, African nutrition society, AMU, Arab Maghreb union; AS-PADAM, Africa's study on physical activity and dietary assessment methods; AU, African union; BMI, body mass index; CEMAC, economic community of central African States; CIA, United States Central Intelligence Agency; COMESA, common market for eastern and southern Africa; EAC, East African community; ECCAS, economic community of central African states; ECOWAS, economic community of West African states; HDI, human development index; ICDA, international confederation of dietetic associations; IUNS, international union of nutritional sciences; NCD, non-communicable diseases; SACU, southern African customs union; SADC, southern African development community; UNDP, United Nations development programme; UNO, United Nations Organization; WHO, World Health Organization.

should be considered to prevent unsuccessful outcomes[26]. Based on an example from the Southern African development community, Thow *et al.*[27] emphasised the importance of regional integration in the implementation of policies to target malnutrition and associated non-communicable diseases. A pan-African approach might prevent duplication of work and fragmentation of resources while stimulating between-countries attainment and learning[28]. It is well established that in Africa a substantiated regional integration and bilateral partnerships exists to address the diverse economic, social and health concerns at supranational or regional levels. Actually, multiple cross-border regional institutions/entities/movements are supporting the economic development and health systems implementation and improvement across countries. The West African

Table 2. African countries development and socio-economic indicators

Country	UN region	Regional membership	Official-other languages*	HDI	SCI	NSDS[†]
Algeria	Northern	AMU	Arabic, Tamazight – French (l.f.)	0·736	53·33	Implementation
Angola	Middle	SADC, ECCAS	Portuguese – Umbundu	0·532	47·78	Implementation
Benin	Western	ECOWAS, WAEMU	French – Fon, Yoruba	0·480	66·67	Implementation
Botswana	Southern	SACU, SADC	English – Setswana, Sekalanga	0·698	45·56	Implementation
Burkina Faso	Western	ECOWAS, WAEMU	French – Mossi, Fulani	0·402	67·78	Implementation
Burundi	Eastern	COMESA, EAC, ECCAS	French – Kirundi	0·400	55·56	Expired[‡]
Cameroon	Middle	CEMAC, ECCAS	French, English	0·646	55·56	Implementation
Cape Verde	Western	ECOWAS	Portuguese – Crioulo	0·512	66·67	Implementation
Central African Republic	Middle	CEMAC, ECCAS	French – Sangho	0·350	52·22	Implementation
Chad	Middle	CEMAC, ECCAS	Arabic, French – Sara	0·392	65·56	Implementation
Comoros	Eastern	COMESA, ECCAS	Comorian, French, Shikomoro	0·503	42·22	Implementation
Congo (Republic of the)	Middle	CEMAC, ECCAS	French – Lingala, Monokutuba	0·591	57·78	Implementation
Cote d'Ivoire	Western	ECOWAS, WAEMU	French	0·462	58·89	Implementation
Congo (Democratic Republic of the)	Middle	COMESA, SADC, ECCAS	French – Linguala, Swahili	0·433	57·78	Implementation
Djibouti	Eastern	IGAD, COMESA	Arabic, French – Somali, Afar	0·470	46·67	Implementation
Egypt	Northern	COMESA, PAFTA	Arabic – English, French	0·690	91·11	No strategy
Equatorial Guinea	Middle	CEMAC, ECCAS	French, Spanish – Fang, Bubi	0·587	42·22	Expired[§]
Eritrea	Eastern	IGAD, COMESA	Arabic, English, Tigrinya	0·391	27·78	Expired[‖]
Ethiopia	Eastern	IGAD, COMESA	Amharic, Oromo, Somali	0·442	68·89	Implementation
Gabon	Middle	CEMAC, ECCAS	French – Fang, Myene, Nzebi	0·684	40·00	Implementation
Gambia	Western	ECOWAS	English – Mandinka, Wolof, Fula	0·441	65·56	Expired[¶]
Ghana	Western	ECOWAS	English – Asante, Ewe, Fante	0·579	65·56	Expired[§]
Guinea	Western	ECOWAS	French	0·411	53·33	Implementation
Guinea-Bissau	Western	ECOWAS, WAEMU	Portuguese – French, Crioulo	0·420	44·44	Awaiting adoption
Kenya	Eastern	IGAD, COMESA, EAC	English, Kiswahili	0·548	54·44	Implementation
Lesotho	Southern	SACU, SADC	English, Sesotho – Zulu	0·497	65·56	Implementation
Liberia	Western	ECOWAS	English	0·430	51·11	Expired[§]
Libya	Northern	COMESA, AMU, PAFTA	Arabic – Italian, English, Berber	0·724	22·22	No strategy
Madagascar	Eastern	COMESA, SADC	French, Malagasy – English	0·510	58·89	Implementation
Malawi	Eastern	COMESA, SADC	English – Chichewa	0·445	76·56	Implementation
Mali	Western	ECOWAS, WAEMU	French – Bambara	0·419	65·56	Implementation
Mauritania	Western	AMU	Arabic – Pular, Soninke, Wolof	0·506	66·67	Implementation
Morocco	Northern	AMU, PAFTA	Arabic, Tamazight – French	0·628	81·11	Expired[‖]
Mozambique	Eastern	SADC	Portuguese – Emakhuwa	0·416	72·22	Implementation
Namibia	Southern	SACU	English – Oshiwambo	0·628	47·78	Implementation
Niger	Western	ECOWAS, WAEMU	French – Hausa, Djerma	0·348	71·11	Implementation
Nigeria	Western	ECOWAS	English – Hausa, Yoruba	0·514	71·11	Expired[‖]
Rwanda	Eastern	COMESA, EAC, ECCAS	English, French, Kinyarwanda	0·483	73·33	Implementation
Sao Tome and Principe	Middle	ECCAS	Portuguese – Forro	0·555	65·56	Implementation
Senegal	Western	ECOWAS, WAEMU	French – Wolof, Pular, Jola, Mandinka	0·466	75·56	Awaiting adoption
Sierra Leone	Western	ECOWAS	English – Mende, Temne, Krio	0·413	63·33	Awaiting adoption
Somalia	Eastern	IGAD	Arabic, Somali – English	0·285	20·00	No strategy
South Africa	Southern	SACU, SADC	English, isiZulu, isiXhosa, Afrikaans, Sepedi, Setswana, Sesotho, XiTsonga, Siswati, Tschivenda, isiNdebele	0·666	81·11	Implementation

Table 2. (*Cont.*)

Country	UN region	Regional membership	Official-other languages*	HDI	SCI	NSDS†
Sudan	Northern	IGAD, COMESA, PAFTA	Arabic, English – Nubian	0·479	51·11	Implementation
South Sudan	Eastern	IGAD, EAC	English – Arabic	0·467	34·44	Implementation
Swaziland	Southern	COMESA, SACU, SADC	English, Swati	0·531	58·89	Expired
Tanzania	Eastern	SADC, EAC	English, Swahili	0·521	76·56	Implementation
Togo	Western	ECOWAS, WAEMU	French – Ewe, Mina	0·484	65·56	Implementation
Tunisia	Northern	AMU, PAFTA	Arabic – Berber, French	0·721	76·67	Expired‡
Uganda	Eastern	IGAD, COMESA, EAC	English – Swahili	0·483	72·22	Implementation
Zambia	Southern	COMESA, SADC	English	0·586	60·00	Implementation
Zimbabwe	Southern	COMESA, SADC	English, Ndebele, Shona	0·509	62·22	Implementation

AMU, Arab Maghreb union; CEMAC, central African and monetary community; COMESA, common market for eastern and southern Africa; EAC, East African community; ECCAS, economic community of central African states; ECOWAS, economic community of West African states; HDI, human development index; l.f, langua franca; IGAD, intergovernmental authority for development; NSDS, national strategy for the development of statistics; PAFTA, pan-Arab free trade area; SADC, southern African development community; SACU, southern African customs union; SCI, statistical capacity indicator; WAEMU, West African economic and monetary union.

* In some cases like South Africa, not all the official languages were inventoried. In other countries such as Côte d'Ivoire, there were too many represented languages without any predominance.

† Current status of the NSDS; for expired strategies superscripts indicate status of the future NSDS.

‡ Completed, awaiting adoption.

§ Being designed.

‖ Planned.

¶ Not yet planned.

Health Organisation or the common African Regional Nutrition Strategy 2015–2025 by the African Union are examples among others[12]. Similarly, the Scaling Up Nutrition movement under the direct anchorage of an assistant to the UN Secretary-General is continuously advocating for a high leadership commitment from all participating countries[29].

Economic integration and nutritional indicators

Two groups of indicators: 'economic integration' and 'nutritional' likely to influence the effective implementation of national or supranational dietary surveillance in Africa were reviewed (Table 1). Economic integration indicators include variables that can be used in any research thematic to profile, rank or cluster countries and is composed of regional integration, language, economic and social development and national statistical capacity aspects. Nutritional indicators include country's undernutrition and overnutrition prevalence, existence of scientific societies and networks for nutritionists and dietitians, and dietary or food risk assessment at the country level. The indicators were gathered following four steps: (i) identification of the indicators and their rationale, (ii) definition of the indicators, (iii) collection of the indicators into a database, (v) visualisation of the geographical distribution of the indicators. Potential indicators are available from international organisations databases, governmental agencies websites, scientific publications or through contact with existing nutrition networks for complementary or missing information (e.g. the African nutrition society). The relevant indicators were: UN geographical regions[30], African regional integration membership[31], national languages[32], national economic and social development status[33], statistical capacity indicator[34], national strategy for the development of statistics' status[35,36], prevalence of underweight, overweight and obesity[4], existence of nutrition or dietetic societies[37,38], participation in the Africa's study on physical activity and dietary assessment methods network[39], national group for WHO food consumption global environment monitoring system[40], status of the implementation of a food safety programme[41] and availability of a precedent national dietary intake survey (structured research from scientific search engines).

Countries according to economic integration and nutritional indicators

According to economic integration indicators

For the fifty-two African countries, the recent available country indicators are summarised in Tables 2 and 3. Supplementary figure shows the indicators processed as maps allowing geographical visualisation. From Table 2, it can be drawn that regional integration is well established in Africa, and all the countries are member of at least one regional integration entity and several countries have dual- or multi-memberships. The most predominant official languages are Arabic, English, French and Portuguese, with the majority of the countries having their own local languages as *Lingua franca*. For Ethiopia and South Africa, local languages were noticeably represented as official languages. Arabic and Berber, Hausa, Yoruba,

Table 3. Nutritional and diet-related indicators to profile African countries

Country	UW-male (%)*	UW-female (%)*	OW-OB male (%)†	OW-OB female (%)†	Nutrition society	Dietetic society	AS-PADAM network	GEMS cluster	Food safety programme‡	National dietary survey
Algeria	4·4	4·1	55·7	62·6	Yes	No	Yes	1	Drafted strategy	No
Angola	17·7	11·7	23·9	37·8	Yes	No	No	3	None	No
Benin	11·9	9·5	20	37·7	Yes	No	Yes	3	Drafting in progress	No
Botswana	11·4	6·3	37·1	59·0	No	No	No	13	None	No
Burkina Faso	13·7	14·1	17·4	29·8	Yes	No	Yes	13	Situation in progress	No
Burundi	15·9	12·9	8·2	22·6	No	No	No	1	Situation in progress	No
Cameroon	7·9	6·4	25·1	41·8	Yes	No	Yes	3	None	No
Cape Verde	9·2	7·5	31·8	41·9	No	No	No	5	None	No
Central African Republic	19·1	14·6	14·6	28·4	No	No	No	13	None	No
Chad	14·8	14·2	17·6	34·1	No	No	No	13	None	No
Comoros	12·3	9·4	14·9	33·8	No	No	No	14	None	No
Congo (Republic of the)	15·7	12·2	13·4	40·3	No	No	No	3	None	No
Cote d'Ivoire	8·3	7·9	15·4	37·7	Yes	No	No	3	Drafting in progress	No
Congo (Democratic Republic of the)	19·1	14·3	26·9	27·6	Yes	No	No	3	None	No
Djibouti	12·9	11·6	26·9	37·0	No	No	No	5	Unavailable	No
Egypt	1·7	0·9	55·8	68·2	Yes	No	Yes	6	Unavailable	No
Equatorial Guinea	14·5	8·4	35·3	48·4	No	No	No	1	Drafted strategy	No
Eritrea	20·4	19·7	11·8	26·2	No	No	No	13	None	No
Ethiopia	20·2	17·3	11·5	26·3	Yes	No	No	13	None	Yes
Gabon	10·7	7·0	40·6	49·0	No	No	No	16	None	No
Gambia	12·1	11·1	25·6	39·3	Yes	No	No	13	Situation in progress	No
Ghana	9·5	6·6	23·5	43·6	Yes	No	Yes	3	Situation finalised	No
Guinea	12·9	11·2	18·4	32·6	Yes	No	No	3	Situation finalised	No
Guinea-Bissau	13·1	11·2	19·4	32·6	No	No	No	9	None	No
Kenya	13·3	9·9	17·7	34·6	Yes	No	Yes	13	Drafted strategy	No
Lesotho	13·5	5·7	19·3	51·1	No	No	No	1	None	No
Liberia	9·8	9·0	17·4	32·7	No	No	No	3	Drafting in progress	No
Libya	2·0	2·0	66·5	70·9	Yes	No	No	1	Unavailable	No
Madagascar	16·1	16·5	15·2	30·3	Yes	No	No	3	None	No
Malawi	14·0	10·5	12·9	30·9	No	No	Yes	13	Situation in progress	No
Mali	13·8	11·8	19·1	31·1	No	No	No	13	None	No
Mauritania	12·4	9·8	25·2	35·5	No	No	No	1	Situation in progress	No
Morocco	3·6	3·7	52	60·8	Yes	No	Yes	1	Unavailable	No
Mozambique	15·3	11·8	13·5	29·8	No	No	Yes	3	Drafted strategy	No
Namibia	11·1	8·7	30·2	54·8	No	No	Yes	13	None	No
Niger	17·1	14·4	12·7	26·3	No	No	No	13	Drafting in progress	No
Nigeria	11·0	9·4	26·0	40·9	Yes	Yes	Yes	13	Drafted strategy	Yes
Rwanda	12·9	9·0	11·6	27·7	Yes	No	No	16	Drafted strategy	No
Sao Tome and Principe	6·3	7·6	24·2	40·1	No	No	No	17	None	No

Table 3. (*Cont.*)

Country	UW-male (%)*	UW-female (%)*	OW-OB male (%)†	OW-OB female (%)†	Nutrition society	Dietetic society	AS-PADAM network	GEMS cluster	Food safety programme‡	National dietary survey
Senegal	14·0	11·9	22·4	37·7	Yes	No	Yes	13	Situation in progress	No
Sierra Leone	11·9	10·6	17·6	34·0	No	No	No	1	None	No
Somalia	14·8	14·1	14·9	26·5	No	No	No	13	Unavailable	No
South Africa	6·7	3·3	43·2	64·0	Yes	Yes	Yes	1	None	Yes
Sudan	11·8	9·0	21·5	34·1	No	No	Yes	13	Unavailable	No
South Sudan	N/A	N/A	21·5	34·1	No	No	No	N/A	Unavailable	No
Swaziland	9·8	4·8	27·3	55·2	No	No	No	1	None	No
Tanzania	11·9	10·9	17·2	34·4	Yes	No	No	13	Drafting in progress	No
Togo	11·9	9·7	13·2	30·4	No	No	No	3	Drafted strategy	No
Tunisia	11·5	3·1	59·3	66·4	Yes	No	Yes	1	Unavailable	No
Uganda	13·9	9·4	17·1	34·1	Yes	No	Yes	16	Drafted strategy	No
Zambia	12·1	5·6	19·5	38·9	No	No	No	3	None	No
Zimbabwe	17·1	8·1	16·2	44·8	No	No	Yes	1	None	No

N/A, non-available; AS-PADAM, Africa's study on physical activity and dietary assessment methods; GEMS, global environment monitoring system; OB, obesity; OW, overweight; UW, underweight.
* BMI < 18·5.
† BMI > 24·99.
‡ Data available only for AFRO countries.

Swahili or their variants are the predominant *Lingua franca* in northern, Sahelian, western and eastern parts of Africa, respectively. The majority of African countries are ranked in low-to-medium human development index groups with the few exceptions of Algeria, Tunisia and Libya ranked as high human development index countries. Morocco, Egypt and South Africa have high statistical capacity indicator (>80), while most West African countries showed a moderate statistical capacity indicator between 65 and 80. Interestingly, a significant number of countries are in process to implement a national strategy for the development of statistics, or are planning to in a near future.

According to nutritional indicators

Table 3 shows that overweight and obesity prevalence is high in all Africa, with South Africa and northern African countries showing the highest rates. Obesity prevalence is higher in women than in men, for all the countries. In contrast to northern Africa, high prevalence of underweight was observed in Central Africa, in the Horn of Africa and in the Sahelian regions. National nutrition societies are widespread throughout Africa, with few societies effective in middle and southern Africa. Contrarily to nutrition societies, dietetic societies are available only in Nigeria and South Africa. The majority of the southern African countries not having a nutrition society have however participated in the Africa's study on physical activity and dietary assessment methods network, while in the other parts of the continent, participating countries are the one having a nutrition society. Few countries have implemented a food safety assessment programme, but the majority are still drafting

a national one. According to food consumption patterns of the countries, most African countries are classified in the G13 (diet based on cereal grains and starch, roots and tubers boiled, milks; western and eastern Africa), G03 (diet based on roots and tubers boiled, cereal grains, tropical and subtropical fruits; western and middle Africa) and G01 (diets based on cereal grains and starch, milks, sweeteners; northern Africa) groups. Few groups such as G06 (diet based on cereal grains and starch, fruiting vegetables and mushrooms) and G05 (diet based on cereal grains and starch, milks, tropical and subtropical fruits) are also found across the continent.

Integrative approach in the collection and use of nutritional data

Despite the heterogeneity of African countries, similarities can be exploited for common stepwise implementation of diet-related initiatives. To better understand and address the common challenges in nutrition, there is a need to increase and improve data collection and standardisation in Africa. Nonetheless, to date there is still a lack of nutritional and agricultural data in national statistical systems as deplored by the FAO of the UN[42]. In their effort to collect more national statistical data, African countries are harmonising statistical methodologies. Statistical data collection improvement in Africa is led by numerous initiatives amongst which are the African statistical coordination committee, the strategy for the harmonization of statistics in Africa, the reference regional strategic framework for statistical capacity building in Africa, all supervised by the African Union. Embedding nutrition and dietary surveillance programme into the national statistical systems might be

cost-effective and sustainable in the longer term. For example, as first step, nutrition and dietary surveys data could be integrated to national health surveys, as in the recent case in South African National Health and Nutrition Examination Survey.

Lessons from other initiatives

Africa could learn from experiences from other regions of the world. For example, at the European level, several countries have already implemented their national surveillance programmes, using the computer-based programme GloboDiet (initially known as EPIC-Soft) developed at the International Agency for Research on Cancer. The methodology, previously used for dietary data collection during the European prospective investigation into cancer and nutrition study[43], is based on the 24 h dietary recall method and aims to collect individual food consumption data for monitoring and surveillance. The data collected with the GloboDiet international methodology has shown good validity when correlated with the concentration of biological markers[44–47]. Moreover, GloboDiet is standardised to minimise errors at all levels from data collection to data analysis[48] and quality controls have been developed, validated and incorporated into the methodology[49]. Additional efforts to adapt the methodology in other regions world have been pilot-tested in Brazil and Mexico[50] and in the Republic of Korea[51].

For that purpose, an investigation to evaluate the GloboDiet with regard to the specific cultural, scientific, ethical, sociological context of Africa have been conducted with twenty-nine African experts in dietary assessment and the flexibility of the methodology has been appraised by the panel[52]. These recent achievements may complement concomitant initiatives such as the INFOODS project led by FAO on food composition tables[53], the global individual food consumption data by FAO/WHO to gather and disseminate existing dietary data nationally and sub-nationally in different countries, and recently, the international dietary data expansion project led by Tufts University aiming at improving dietary data collection, particularly in low- and middle-income countries.

Conclusion

The endorsement by the African union of the agenda 2063 with a mid-point evaluation expected in 2030 will address extensive human, social and scientific development challenges, including achieving food and nutrition security for Africa. This agenda will enormously depend on sharing experiences and their positioning together with the other initiatives on the continent to avoid duplication of efforts and cost-effective use of limited resources. African countries should therefore be empowered in collecting comparable and reliable diet-related information for dietary surveillance, food safety, research and prevention by leveraging resources mobilisation in the resource-constrained environment. The competing allocation of limited resources in the development agenda in African countries requires implementing cost-effective projects of shared interests and preventing duplication of efforts and fragmentation of resources. Countries profiling and clustering could also provide science-based evidence in early phase of study design and implementation planning and guide towards better choices, particularly in the context of pan-African initiatives. This could also help selecting pilot countries matching best the pre-selected criteria to increase chances of success when used as proof of principle, before further extension.

Authorship

N. S. designed the concept; E. K. A. inventoried the indicators and drafted the manuscript; E. L., G. N., M. G., P. A. and F. Z. provided expertise on the manuscript, and provided additional corrections. All authors have read and approved the manuscript.

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