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Development and Pilot Study of myfood24 West Africa—An Online Tool for Dietary Assessment in Nigeria

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Abstract: Background/objective: Tools to accurately and efficiently measure the dietary intake of Nigeria are lacking. We aimed to develop and assess the usability of a new online dietary assessment tool for Nigeria, myfood24 West Africa. Methods: We developed myfood24 West Africa database using data from existing food composition tables, back-of-pack labels of packaged foods and research articles. A 7-step approach was used: identified data sources, selected foods, processed/cleaned data, calculated nutrient content of recipes, created/allocated portion sizes, quality-checked database, and developed food accompaniments. To pilot myfood24 West Africa, we recruited 179 university staff living in Nigeria using a cross-sectional design; usability was assessed using a questionnaire that incorporated the System Usability Scale (SUS) and feedback session. Results: The database included 924 foods with up to 54 nutrients and 35 portion-size images allocated to foods. 60% of the data were sourced from the 2019 West Africa Food Composition Table, 17% from back-of-pack labels, 14% from the 2017 Nigeria Food Composition Table, 5% from generated recipes and 4% items from published literature. 30% (n=53) self-recorded their diet on their own and 1345 entries were made. The mean SUS score of 74 (95% CI: 68,79) indicated good usability. The feedback showed the tool was easy to use, educative, and included a variety of locally foods consumed. Conclusion: This new tool will enhance the dietary assessment of the Nigerian population. More work will cover more foods from other regions of Nigeria and West African countries.

Keywords: food composition tables; energy intake; nutrition assessment; nutrition app; usability study; digital tool; diet monitoring

1. Introduction

An accurate and efficient assessment of a population's diet is needed to understand the links between diet and health- and nutrition-related outcomes in population-based studies. The accuracy of the dietary assessment depends on the dietary assessment methods and tools used which are prone to measurement errors if not carefully and objectively selected[1]. Underlying food composition tables play an important role in estimating nutrient intake; however, they often do not include the range of foods available in a specific region, including packaged foods and culturally significant mixed dishes, especially in African countries[2], making it challenging to accurately monitor the impact of the nutrition transition on health. Furthermore, the limitation contributes to the existence

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of dietary data gaps and slows down progress in addressing nutrition problems[3]. Therefore to accurately measure energy and nutrient intake, food composition databases need to be comprehensive to capture the full range of foods consumed in a specific population [4].

Dietary intake data in Africa is most commonly collected using 24-hour recalls and food frequency questionnaires (FFQ)[5,6]. Traditionally the 24-hour recalls are paper-based, interviewer-administered, time-consuming, expensive; and these limit their use of in large national surveys in Nigeria[7]. Conversely, FFQs have remained the method of choice despite their limitations, but may not give valid estimates of actual nutrient intakes[8]. In recent times, technology-based 24-hour recall tools are emerging and reported to be reliable alternatives to traditional recording methods[9–11]. Nigeria is experiencing a large growth in the use of technology, with 55% having access to the internet in 2021, up from 1% in 2001[12]. However, the increasing use of dietary analysis software lacks inclusion of portion sizes and common Nigerian foods[5]. This presents an opportunity to enhance dietary assessment methods in Nigeria.

myfood24 is an online dietary assessment with over 200,000 foods [13], initially developed to support dietary research in the UK, myfood24 now includes international food composition databases to support dietary assessment of various populations around the world. Whilst the usability of myfood24 was tested and found to be suitable for both British and non-British populations [14,15], its applicability in Nigeria has not been tested. Our study aimed to adapt myfood24 for West Africa, with a focus on Nigeria, and test its usability among Nigerian adults.

2. Materials and Methods

Following guidelines[16], steps taken taken to develop myfood24 West Africa are summarised below and in Figure 1 below:

2.1.1. Identification of Relevant Food Composition Tables/Database

The four (4) database sources used were:

1. The 2019-West Africa Food Composition Table (WAFCT): Contains 1028 foods commonly consumed in West African countries[17];
2. The 2017-Nigerian Food Composition Table (NFCT): Contains 282 foods consumed in Nigeria [18];
3. Data from back-of-pack labels of packaged foods from one major supermarket in Abia State, another major supermarket in Enugu State and a local food store in Abia State.
4. Literature of mixed foods and generic foods.

2.1.2. Identification and Selection of Foods

All foods identified in our sources 2 and 3 (above) were selected. In addition, we selected foods from sources 1 and 4 based on food names, synonyms, descriptions and ingredients known to the local researchers and publications of commonly consumed foods[19,20]. Focusing on Nigeria, we selected 762 foods from the WAFCT if they were also available in the NFCT, composition data were sourced from Nigeria or if they are commonly consumed in Nigeria. Of these 762 foods, we excluded 207 foods whose data were sourced from the UK food composition tables, as they were already in the myfood24 system.

2.1.3. Data Processing and Cleaning

Our food database was created using a myfood24 data extraction template on Microsoft Excel. We prioritized data with the most comprehensive nutrient analysis when there were duplicates. We kept similar foods cooked by different cooking methods; e.g., “plantain, ripe, boiled” and “plantain, ripe, fried in oil” in the database.

Nutrient units were reformatted to match in myfood24 formats, e.g. vitamin D was converted from IU to μg. When back-of pack labels provided nutrient values per portion sizes, we converted them to per 100g or 100ml. We calculated the value of any missing macronutrient by subtracting the

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calories obtained from the available macronutrients from the total calories and then dividing by the Atwater factor of the nutrient. For all raw foods included in our database, we added yield factors [21,22] so that the accurate nutrient values can be computed.

2.1.4. Creation of Mixed Dishes

To include food composition data of mixed dishes that were not available from our data sources into myfood24, we adopted standard steps for recipe calculation[23] within myfood24system. We selected the dishes and recipes with two local recipe books created for rural women in Nigeria [24,25]. Only main ingredients were used to create these recipes since traditional foods in Nigeria vary greatly. The same dish may be made as a simple recipe with few ingredients to a complex version with a wider variety of ingredients due to cost, availability and ease of preparation. We compared the composition of mixed dishes in our new database with those of similar names in the UK composition tables.

2.1.5. Estimation and Allocation of Portion Sizes

We allocated portion sizes to all foods using various portion estimation units. For generic raw foods, we used standard household measures such as cups and spoons. We also used commercial units of some food items, which are known by the local researcher (author CU, HE and RS), to be commonly prepared in the same quantity as bought from the market, eg "1 cigarette cup of *gari*".

In the absence of any photographic food atlas for Nigeria, researcher (author CU) developed portion images using a guide[26] and experience of the Nigeria context. For soups, rice-based and legume-based dishes, the first portion was the least using the smallest household measure unit- a dessertspoon. Then we increased the portion sizes to 4-7 by increasing the number of dessertspoons. Captured with a smartphone, images ranged from small to large to help users select the closest match to amounts consumed. Some images were used multiple times for with similar appearance[13]. All images were developed using standard and myfood24 photography guidelines[27].

For packaged foods, we collected portion size units and weight per portion from the labels. Where the portion weight was not provided, we calculated it by dividing the total weight by the number of portions.

2.1.6. Development of Food Accompaniments

We compiled common food pairs in Nigeria to prompt users when reporting their intake. This important feature aims to improve recall by providing suggestions for foods often eaten together. For example, sugar, honey, and milk were included as food accompaniments for *ogi*; groundnut for banana, cucumber, and cassava flakes; and gari, *fufu*, *amala*, and semovita for all soups.

2.1.7. Incorporation of the Database into the myfood24 System

The myfood24 team carried out quality checks throughout the database development. The databases was first uploaded to a staging environment for internal testing before running them live on the system. Researchers can now access myfood24-West Africa, with a demo available on the website. To supplement the West African database, the myfood24-UK generic database, containing over 2000 foods compiled from the UK composition table [28], is also available to users.

2.2. Pilot Study and Usability Testing of myfood24

2.2.1. Recruitment

This cross-sectional pilot and usability testing study of myfood24 was carried out at Michael Okpara University of Agriculture Umudike, Abia State in southeast Nigeria. Participants, university staff, were recruited through flyers, oral advertisement, and various WhatsApp groups of staff members. Eligibility criteria included age18 and above, not pregnant or not had a childbirth in the last 3 months, not being diagnosed with diabetes or taking medication to regulate blood glucose

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levels. Demographic characteristics were assessed using on online questionnaire. Participants were informed of a mobile top-up card at the end of the study as a reward for their participation.

2.2.2. Pilot/Feasibility Study

Participants received a pre-recorded video on using myfood24. myfood24 links were sent via email and WhatsApp and we notified participants of the links through regular SMS and calls. Participants had access to the generic myfood24-UK and West Africa databases to report their dietary intake in the preceding 24 hours. To maximize time available for this study, a trained dietitian interviewed the participants who could not self-record, exploring myfood24 as an interviewer-administered tool. The feasibility of myfood-24 among our participants was assessed by the total number of myfood24 food diaries submitted.

2.2.3. Usability Testing

For usability testing, participants that self-recorded received a personalized online questionnaire to assess their competence in the use of technologies, previous food diary use, and system usability (SUS). They rated their agreement with 10 usability statements (1 = strongly agree; 5 = strongly disagree)[29].

2.3. Data and Statistical Analysis

Descriptive analyses were conducted to explore the participants' characteristics. We sorted food entries in myfood24 by database (UK or West Africa), and calculated the contribution of the West African foods to the total energy and nutrient intakes. We checked for difference in BMI and energy intake between self-recorded and interviewed participants using the Mann-Whitney U test. SUS score was calculated in accordance with Brooke[29]. The scores for each of the 10 statements ranged from 0 to 4. For odd statements numbers (1,3,5,7,9), 1 was subtracted from the scale position , while for the even statement numbers (2,4,6,8,10), 5 was subtracted from the scale position. We summed the resulting scores and multiplied by 2.5, giving an overall score ranging from 0-100. A score above 68 or more is regarded as "good". Significance was set at $P < 0.05$. Analyses were performed using Stata version 17.

3. Results

3.1. myfood24 West Africa

myfood24-West Africa version is now live on myfood24 system and incorporates the features and functionality of the original UK version. It contains 924 commonly consumed Nigerian foods and drinks with up to 54 nutrients values per item. A list of the nutrients is provided in Table S1. Sixty percent (n=555) of data was sourced from the 2019-West African Food Composition Table (WAFCT), 17% (n=155) from packaged foods, 14% (n=131) from the 2017-Nigeria Food Composition Table (NFCT), 5% (n=46) from generated recipes and 4% (n=37) from published literature.

As shown in Table S2, foods within the vegetable category had the highest number (n=135, 15%) in the database followed by the meat category (n=112, 12%); the smallest category was the fizzy drink category (n 2, <1%). Most of the food data of items within the categories of fats and oils (22 out of 25, 88%) and milk products (32 out of 41, 78%) were sourced from back of pack labels.

While not in any of the FCTs used, the generated recipes and the published literature were the only data sources of food items within the soups, stews and sauces category. The ingredients used in generating the recipes were included in the food description for each of the recipes andnutrients and were computed per 100g of the cooked food. The nutrient composition of the local dishes in our new database showed a variation of up to 200% from foods with similar names in the UK food composition database. A comparison of some of these dishes is shown in Table 1.

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Table 1. Nutrient composition of selected mixed dishes in the myfood24 West Africa versus UK databases.

Components	Food name													
	Beef pastry[1]		Vegetable soup[2]		Okra dish[3]		Fried rice[4]		Rice and beans dish[5]		Rice dish[6]		Tomato sauce[7]	
	WA	UK	WA	UK	WA	UK	WA	UK	WA	UK	WA	UK	WA	UK
Energy (kcal)	213	292	101	55	34	98	173	169	137	170	137	147	196	89
Protein (g)	5.1	9.2	5.0	1.0	1.7	3.0	2.6	3.9	3.0	5.6	2.0	2.9	1.0	2.2
Fat (g)	11.3	17.7	6.8	4.2	2.7	7.7	3.4	5.3	7.0	2.2	6.2	2.6	18.9	5.5
Carbohydrates(g)	24.4	25.5	3.8	3.7	0.7	4.7	32.6	28.1	17.0	34.1	19.1	27.9	5.2	8.6
Fibre (g)	1.3	2.1	1.9	N	0.6	N	1.1	2.8	0.3	N	0.6	0.7	1.6	-
Sodium (mg)	308.6	332.0	357.6	315.0	176.3	25.0	5.7	409.0	0.0	15.0	348.0	326.0	498.0	340.0
Calcium (mg)	44.0	41.0	229.8	14.0	87.0	158.0	3.5	28.0	0.0	19.0	16.5	8.0	15.0	19.0
Iron (mg)	0.9	1.1	6.3	0.3	0.7	1.4	1.4	0.4	0.8	1.3	0.1	0.7	0.3	0.6
Vitamin A (µg)*	104.3	N	143.9	245.0	10.6	109.0	22.0	4.0	0.0	N	16.3	9.0	86.1	204.0
Folate (µg)	8.6	2.0	11.5	6.0	13.2	45.0	6.0	8.0	0.0	50.0	9.8	6.0	15.7	9.0
Vitamin C (mg)	0.4	N	86.6	2.0	3.9	13.0	0.0	tr	0.0	Tr	4.1	3.0	12.4	8.0
% difference	**7 – 125%**		**3 – 182%**		**55 – 165%**		**2 – 194%**		**0 – 104%**		**7 - 150%**		**24 – 110%**	

* retinol equivalent, WA- myfood24 West Africa, UK- UK composition of foods integrated dataset; tr-trace value; N- reliable information on the amount is lacking; 1- For WA: Meat pie (beef), For UK: Pie, beef, puff or shortcrust pastry, individual, retail; 2-For WA: Vegetable soup, For UK: Soup, vegetable, homemade; 3- For WA: Okro soup; For UK: -Okra with tomatoes and onion, West Indian, homemade; 4- For WA: Fried rice; For UK: -Rice, egg fried, ready cooked, re-heated, retail, not takeaway; 5- For WA: Jollof rice and beans; For UK: -Rice and black-eye beans; 6- For WA: Jollof rice; For UK: -Pilaf, rice with tomato, homemade; 7- For WA: tomato stew; For UK: Tomato sauce, homemade.

Portion images were developed for 15 local foods (each with up to 7 different portion sizes) in our database to help users estimate amounts of foods when consumed. For example, some of the portion images are shown in Figure 2. In addition, we also applied 25 foods with portion images in the original UK database to similar foods in our database. Some images were used multiple times for foods which were similar in appearance.

3.2. Pilot of myfood24 West Africa

With a response rate of 52%, 179 participants had 24-hour dietary recall data in the study, and the mean age was 38.5 ± 8.7 years. The majority of our participants were married (68%), had a university degree (85%), and were within the senior staff cadre (58%). The characteristics of the participants have been detailed in Table 2. A total of 1345 food/drink entries were made with a median number of 7 (IQR: 5, 9) food/drink entry per day per participant. Of the foods available for selection, *gari* was the most selected (n=96, 11%), followed by tomato stew (n=72, 8%) from our new database (Table S3).

Foods from our database contributed 60-82% of the energy and nutrient intake in our pilot study. Table 3 details the contribution of the foods in our database in the pilot study. 30% (n=53) self-recorded their dietary intake. There was no significant difference in the energy intake (p=0.67) and body mass index (p=0.82) of participants who self-recorded their intake and those whose intake were interviewed.

With a response rate of 87%, 39 participants who used the myfood24 on their own completed the user questionnaire. Their mean age was 39.2 ± 8.0 years, and the majority had attended a university (92%), had good confidence in using technology (100%) but had never self-completed or reported their food intake in the past (67%). Detailed characteristics of the participants is shown in

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Table 4. The mean system usability score (SUS) of myfood24 among our participants was 74 out of 100 and indicates that it is a usable dietary assessment tool.

Some participants (n=37) who used myfood24 on their own provided feedback on their favourite and least favourite aspects of the tool. Some emphasized the ease of use (n=11), with one describing it as 'very simple and easy to use', and another stating, 'The fact that I could participate in the research from the comfort of my home'. The tool's innovation was acknowledged by participants (n=4) with one stating, 'The clear separation of foods eaten and drinks taken' and another, mentioning, 'It is more efficient than manual recording'. Participants (n=5) also commended the presence of local foods, with one noting, 'The availability of certain foods like utazi in the App'.

Table 2. Characteristics of the pilot study participants.

Characteristics	All participants (n=179)	Self-administered myfood24, n= 53 (30%)	Interviewer-administered myfood24, n=126 (70%)
Age, years (mean (SD))	41.2 (9.2)	38.5 (8.7)	42.7 (9.2)
	n (%)	n (%)	n (%)
Age, years			
20-29	15 (8)	8 (15)	7 (6)
30-39	62 (35)	21 (40)	41 (33)
40-49	69 (39)	20 (38)	49 (39)
50-59	27 (15)	3 (6)	24 (19)
60-69	6 (3)	1 (1)	5 (4)
Gender			
Male	85 (47)	25 (47)	60 (48)
Female	95 (53)	28 (53)	66 (52)
Marital status			
Currently single	57 (32)	20 (38)	37 (29)
Married	122 (68)	33 (62)	89 (71)
Place of residence			
Rural	63 (35)	15 (23)	48 (38)
Urban	116 (65)	38 (33)	78 (62)
Job rank			
Junior non-teaching	28 (16)	6 (11)	22 (17)
Senior non-teaching	104 (58)	23 (44)	81 (65)
Teaching	47 (26)	24 (45)	23 (18)
Educational level			
Secondary or less	15 (8)	3 (6)	12 (10)
Post-Secondary	13 (7)	2 (4)	11 (9)
Graduate/Postgraduate	151 (85)	48 (90)	103 (81)
Profession			
Non-Nutritionists (%)	167 (93)	41 (77)	126 (100)
Nutritionists (%)	12 (7)	12 (23)	0 (0)
Religion			
Christianity	177 (98)	53 (100)	124 (98)
Islam	1 (1)	0 (0)	1 (1)
Others	1 (1)	0 (0)	1 (1)
Smoking status			
Current smoker	1 (1)	0 (0)	1 (1)
Non-smoker	178 (99)	53 (100)	125 (99)
Alcohol intake			
Current drinker	113 (63)	37 (70)	76 (60)

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Non-drinker	66 (37)	16 (30)	50 (40)
Body mass index			
Underweight	5 (3)	1 (2)	4 (3)
Normal	59 (33)	17 (32)	42 (33)
Overweight	62 (35)	19 (36)	43 (34)
Obese	53 (29)	16 (30)	37 (30)

Table 3. Percentage contribution by food type of myfood24 West Africa database to energy and nutrient intakes.

	Food groups																
Nutrients	**Bread (5/38)**	**Snacks (34/116)**	**Cereals (106/64)**	**Spices (37/13)**	**Fats/oils (25/40)**	**Fish (61/83)**	**Fizzy drink (2/7)**	**Fruits (44/95)**	**Legumes (89/4)**	**Meat (112/227)**	**Milk (41/132)**	**Nuts (45/25)**	**Soups (35/58)**	**Roots/tubers (95/32)**	**Sugar (20/72)**	**Vegetables (135/125)**	**Total (95% CI)**
Energy	0	4	14	0	1	1	1	1	6	1	2	3	12	30	1	0	78 (66, 80)
Protein	0	3	13	0	0	5	0	1	11	6	3	4	15	11	1	0	73 (66, 80)
Fat	0	5	12	0	3	2	0	1	8	2	3	5	32	8	1	0	82 (78, 87)
Carbohydrate	0	4	16	0	0	0	2	2	5	0	1	1	3	40	2	0	76 (69, 82)
Fibre	0	4	9	0	0	0	0	2	6	0	0	2	18	26	1	1	70 (63, 76)
Sodium	0	5	6	0	0	2	1	0	3	1	1	0	42	13	0	0	74 (67, 80)
Iron	0	2	14	0	0	2	0	1	7	4	1	1	16	29	3	1	81 (74, 86)
Vitamin A	0	8	4	0	5	2	0	3	2	3	8	0	30	4	1	1	71 (64, 77)
Folate	2	4	7	0	0	2	3	1	5	1	3	1	20	12	1	0	60 (52, 67)
Vit C	0	1	3	0	0	0	0	2	3	2	2	0	34	17	4	2	70 (63, 76)
Number of foods items*	2	44	115	7	11	39	21	27	64	76	33	38	193	185	37	17	909

The figures beneath the food groups represent the number of foods in our new West Africa and UK generic databases. For example there are 5 and 38 bread products in our new WA and UK generic databases, respectively. Snacks include pastries, cakes and biscuits. Sugar include confectioneries and powdered sweetened

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drinks. Eggs and alcoholic drinks were not selected from the WA database. *Number of foods items consumed and selected from the WA database by food type by participants.

Participants lauded the ability to estimate amounts of foods eaten using portion images included in the system (n=7) with one commenting, 'The picture helped me select the food I ate'. The option to view a summary of total energy and macronutrients was appreciated by participants (n=7), as one shared, 'My favourite thing about myfood24 is the nutrient summary that shows after submission of the food diary'.

On the other hand, participants noted areas of improvement. Two mentioned the absence of specific foods, with one stating 'I didn't find my *kuli-kuli*'. Another insight from five participants indicated that they would have preferred using images for portion size estimation instead of portion weights used for some foods: 'To input quantities of foods consumed was a bit difficult without images'. The set up for this project using myfood24 required an internet connection, and participants were required to recall meal times. Two participants found this challenging and stated, 'it consumes my data', and another mentioned, 'Trying to remember the time I ate'.

4. Discussion

myfood24-West Africa is the first online dietary assessment tool tailored to Nigerian foods, with usability evaluated. With 954 foods, our new database contains 3 times the foods in the Nigeria Food Composition Table, including traditional foods, cooked and mixed dishes and packaged foods. To reduce the high costs of food composition database development using analytical methods[3], we used indirect methods with data from existing sources with standardised methods. This approach, also adopted by other compilers[30,31], is valid for building food composition databases[4,32].

Our data comes primarily from the 2019-WAFCT, hence the name myfood24-West Africa. While the 2019-WAFCT addressed the need for a regional food composition database[17], our work goes further to provide digital dietary assessment. We suggest collaboration between food data compilers in West Africa and myfood24 team for updates to ensure regional representation.

Our database benefits from including branded foods in our database, which are absent in FCTs we used; this is the reflective of the dietary shift from traditional to processed foods [33]. Food labels in Nigeria, regulated by the National Agency for Drug Administration and Control (NAFDAC), provides insights to improving public health[34] and incorporating the packaged foods in databases increase the variety of foods available. Regular updates are needed to capture product changes [35]. Additionally, our work provides a broader range of mixed dishes and nutrients than 2017-NFCT, which is relevant for understanding holistic dietary impact on health. Owing to socioeconomic status and religious beliefs, Nigeria's diverse culture influences dietary habits, highlighting the need for country-specific food composition data. While some nutrient data came from literature and 2017-NFCT, most of them were calculated on the myfood24 system, giving a practical alternative to laboratory analysis [36,37].

Acknowledging that portion size assessment is difficult, we have developed different portion size options for our database. Communal eating is common in Nigeria, making portion estimation even more challenging [28]. Nigerian diets often include mixed dishes and support for portion size estimation is required, particularly if weights are not used, to minimise measurement error. Although not all foods have portion images due to time and resource constraint, the database can be updated to include more and possibly validate them among the population.

This study demonstrates the feasibility of using myfood24-West Africa for dietary assessment research in Nigeria, contributing at least 2/3 of the total energy and nutrient intake. No significant differences were found in the total energy intake or BMI between self-recorded and interviewer-collected data. In addition, the increasing migration of Nigerians to the West, who are less likely to change their diets[38], underscores the need for our new tool for research focused on the diets and targeted interventions of ethnic minority groups.

One-quarter of self-recording participants were nutrition professionals with experience in collecting dietary data, influencing their confidence in using the system. Lack of motivation and

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confidence with digital devices can reduce compliance with digital dietary records[1]. We could not assess confidence for all participants, as this information was not available for the interviewed participants. Our study highlights areas for improving myfood24 West Africa's usability in future research. Despite a good and comparable usability score [14,15], only a-third of the university participants self-recorded, and the reasons could not be investigated. Although myfood24 is quick to use[13,15], we suspect that participants perceived it as time-consuming and did not use it, likely due to staff workload post-strike. The offline feature of myfood24, which could have helped overcome internet access challenges, was not included, possibly leading to fewer people using the tool. Low response rates were also reported in a Kenyan study[39].

Strengths and Limitations

Our study had some strengths and limitations. We introduced myfood24 West Africa as the first online dietary assessment tool with a wider range of foods eaten in Nigeria compared to the current 2017-Nigerian Food Composition Table. Including portion sizes was crucial to help participants accurately estimate their intake-a feature lacking in other nutrition analysis software used in Nigeria. Furthermore, feedback from the myfood24 users in Nigeria gave insights for improvement. Although we could not conduct qualitative research, including quotes from the participants' feedback gave us a better understanding on their experience with the tool[40].

However, it was not possible to conduct laboratory-based food analysis for our database and we were limited by the data available in the food composition tables, back-of-pack information as provided by food manufacturers and recipes used. Furthermore, the branded foods in our database came from food vendors located in 1 out of the 6 geopolitical zones in Nigeria and may not represent the variety of foods available nationwide. Moreover, our databases lacks information on branded alcoholic drinks and foods sold in fast-food outlets in Nigeria. The portion size images of the mixed dishes in our new database were not validated and may not be a true reflection of actual quantities of the foods selected in the pilot study. Finally, it is important to note that our participants were all educated, with at least a secondary education and may not be representative of the wider Nigerian population; however, there is extremely limited information on the dietary intake in Nigeria using detailed measurement tools[33]. Therefore, our findings on the usability of myfood24 cannot be generalized.

5. Conclusions

This paper described how we developed myfood24 West Africa, a technology-based dietary assessment tool that is now live on myfood24 system. The database comprises 924 culturally relevant foods in Nigeria and was compiled using various sources, including the West Africa Food Composition Table, the Nigeria Food Composition Table, back-of-pack labels of branded foods, published articles on nutritional composition of foods, and recipe calculations using the myfood24 system. With the improvements suggested in this study, the validation of portion sizes, and the addition of other West African foods in further updates, myfood24 will be a valuable research tool for investigating the relationships between diet and health outcomes among West Africans, both within West Africa and in the diaspora.

Author Contributions: CAU coordinated design and prepared the first draft of the manuscript; BEE and JEC supervised the research; CAU, CCN, BEE, SB, GW,GOI, RAS, HNE and JEC contributed to the development of the database; CAU, CCN, BEE and JEC contributed to the survey design; CAU, CCN and CGO contributed to the pilot study. All authors read, commented and approved the final manuscript.

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Institutional Review Board Statement: This study was conducted according to the guidelines laid down in the Declaration of Helsinki, and approved by the University of Leeds Research Ethics Board (AREA 21-147), and the Health Research and Ethics Committee of Federal Medical Centre Umuahia (FMC/QEH/G.596/Vol. 10/564. Written informed consent was obtained from all subjects.

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Conflicts of Interest: JEC is the Director of Dietary Assessment Ltd; SB and GW are employees of Dietary Assessment Ltd. CAU, CCN, BEE, GOI, RAS, and HNE have no conflict of interest to declare.

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