ADAFSA | Food Data Source Analysis

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1. Introduction

The "Study of Food Consumption Rate and Dietary Pattern" project requires integration of food related data from several sources. The data sources include the "UAE Food Atlas" and several food databases. The food databases must be made searchable to facilitate study participants finding food items. The databases must also support food composition analysis by maintaining relevant nutrient details for each food item. In preparation for integration, this document records the results of an analysis of the required data sources.

2. Food Composition Analysis Scope

Food composition analysis is comprised of three components:

1. Nutrient analysis.
2. Calories obtained from macronutrients.
3. Food group servings

Each of these components are further described in the following sub-sections.

2.1 Nutrients

The table below list the nutrients that are included in scope of food composition analysis. For each nutrient: a unit of measure is specified, an indication of whether the Dietary Reference Intake (DRI) is calculated, and whether the result is presented to participants. Results for nutrients that are not presented to participants are available for researchers.

	Unit	Calculate Dietary Reference Intakes	Include in Participant Feedback
Caffeine	mg		
Calcium	mg	Yes	Yes
Calories	kcal		Yes
Carbohydrates	g		Yes
Cholesterol	mg		Yes
Fat	g		
Folate	mcg	Yes	

	Unit	Calculate Dietary Reference Intakes	Include in Participant Feedback
Iron	mg	Yes	Yes
Magnesium	mg	Yes	
Mono Fat	g		
Phosphorus	mg	Yes	
Poly Fat	g		
Potassium	mg	Yes	Yes
Protein	g		
Saturated Fat	g		
Sodium	mg	Yes	Yes
Total Dietary Fiber	g		Yes
Trans Fatty Acid	g		
Vitamin A - RAE	mcg		
Vitamin B1 - Thiamin	mg	Yes	
Vitamin B12	mcg	Yes	
Vitamin B2 - Riboflavin	mg	Yes	
Vitamin B3 - Niacin	mg	Yes	
Vitamin B6	mg	Yes	
Vitamin C	mg	Yes	Yes
Vitamin D	mcg	Yes	
Vitamin E - Alpha-Toco	mcg	Yes	
Vitamin K	mcg	Yes	
Water	g		Yes
Zinc	mcg	Yes	

2.2 Calories from Macronutrients

The table below lists the calorie intake calculations that are included in scope of food composition analysis.

	Calories (Unit)	Include in Participant Feedback	Acceptable Macronutrient Distribution Range (AMDR) - Recommended Range
Fat	kcal		
Saturated Fat	kcal		
Trans Fat	kcal		
Carbohydrates	% of total	Yes	% Range
Fat	% of total	Yes	% Range
Saturated Fat	% of total	Yes	% Range
Protein	% of total	Yes	% Range

2.3 Food Groups

The table below lists the food groups that are included in scope of food composition analysis.

	Unit	Include in Participant Feedback
Dairy	cups	Yes
Fruit	cups	Yes
Grain Total	g	Yes
Protein Total	g	Yes
Vegetable Total	cups	Yes

3. Data Sources

3.1 Food Atlas

The UAE food atlas provides a visual prompt for the selection of food portion sizes to facilitate study participants in selecting the amount of food consumed. Where possible food items from the food databases shall be mapped to the different types of portion sizes included in the atlas.

3.2 Food Databases

Participants in a 24-hr recall food consumption survey shall have the option of selecting foods from the following databases:

	Number of Food Items
ADAFSA - UAE	23
ADAFSA - Kuwait	75
ADAFSA - UAE Recipes	104
USDA - Legacy	7,793
USDA - Branded	1,807,154

3.3 Database Nutrient Mappings

The table below provides a mapping between the 30 nutrients included within scope of food composition analysis and the equivalent nutrients available in each of the food databases.

	Unit	ADAFSA - UAE	ADAFSA - UAE Recipes	ADAFSA - Kuwait	USDA - Legacy / USDA - Branded	
Caffeine	mg	Caffeine (mg)	Caffeine (mg)		Caffeine (mg) Caffeine acid (mg)	
Calcium	mg	Calcium (mg)	Calcium (mg)	Calcium (mg)	Calcium, Ca (mg) Calcium, added (mg) Calcium, intrinsic (mg)	
Calories	kcal	Energy calories(Kcal)	Calories (kcal)	Calories (kcal)	Energy (Atwater General Factors) (kcal) Energy (Atwater Specific Factors) (kcal) Energy (kcal) Energy (kj)	
Carbohydrates	g	Carbohydrates (g)	Carbohydrates (g)	Carbohydrates (g) Net Carbs (g) Other Carbs (g)	Carbohydrate, by difference (g) Carbohydrate, by summation (g) Carbohydrate, other (g) Carbohydrates (g)	
Cholesterol	mg	Cholesterol (mg)	Cholesterol (mg)	Cholesterol (mg)	Cholesterol (mg)	
Fat	g		Fat (g)	Fat (g)	Fatty acids, other than 607-615, 617-621, 624-632, 652-654, 686-689) (g)	
Folate	mcg	Folate (mcg)	Folate (mcg) Folate, DFE (mcg)	Folic Acid (mcg)	Folate, total (mcg) Folate, free (mcg) Folic acid (mcg) Folate, food (mcg) Folate, not 5-MTHF (mcg) Folate, DFE (mcg)	
Iron	mg	Iron (mg)	Iron (mg)	Iron (mg)	Iron, Fe (mg) Iron, heme (mg)	

	Unit	ADAFSA - UAE	ADAFSA - UAE Recipes	ADAFSA - Kuwait	USDA - Legacy / USDA - Branded	
					Iron, non-heme (mg) Iron, added (mg) Iron, intrinsic (mg)	
Magnesium	mg	Magnesium (mg)	Magnesium (mg)	Magnesium (mg)	Magnesium, Mg (mg)	
Mono Fat	g	Fatty acids, total monounsaturated (Mono Fat) (g)	Mono Fat		Fatty acids, total monounsaturated (g) Fatty acids, monounsat., other (g) Fatty acids, total monounsat., NLEA (g)	
Phosphorus	mg	Phosphorus (mg)	Phosphorus (mg)	Phosphorus (mg)	Phosphorus, P (mg)	
Poly Fat	g	Fatty acids, polyunsaturated (Poly Fat (g)	Poly Fat (g)	Poly Fat (g)	Fatty acids, polyunsat., other (g) Fatty acids, total polyunsat., NLEA (g) Fatty acids, total polyunsaturated (g)	
Potassium	mg	Potassium (mg)	Potassium (mg)	Potassium (mg)	Potassium, K (mg)	
Protein	g	Protein (g)	Protein (g)	Protein (g)	Protein (g) Adjusted Protein (g)	
Saturated Fat	g	Fatty acids, total saturated (saturated fat) (g)	Saturated Fat (g)	Saturated Fat (g)	Fatty acids, total saturated (g) Fatty acids, saturated, other (g) Fatty acids, total sat., NLEA (g)	
Sodium	mg	Sodium (mg)	Sodium (mg)	Sodium (mg)	Sodium, Na (mg)	
Total Dietary Fiber	g		Soluble Fiber (g)	Dietary Fiber (g) Insoluble Fiber (g) Soluble Fiber (g)	Fiber, total dietary (g) Fiber, soluble (g) Fiber, insoluble (g) High Molecular Weight Dietary Fiber (HMWDF) (g) Low Molecular Weight Dietary Fiber (LMWDF) (g)	
Trans Fatty Acid	g	Trans Fatty acids (g)	Trans Fatty Acid (g)	Trans Fatty Acid (g)	Fatty acids, total trans (g) Fatty acids, total trans-monoenoic (g) Fatty acids, total trans-dienoic (g) Fatty acids, total trans-polyenoic (g)	
Vitamin A - RAE	mcg	Vitamin A, RAE (mcg)	Vitamin A - IU (iu)	Vitamin A - mcg	Vitamin A, IU (iu) Vitamin A, RAE (mcg)	

	Unit	ADAFSA - UAE	ADAFSA - UAE Recipes	ADAFSA - Kuwait	USDA - Legacy / USDA - Branded	
Vitamin B1 - Thiamin	mg	Thiamin (mg)	Vitamin B1 - Thiamin	Vitamin B1 - Thiamin (mg)	Thiamin (mg) Thiamin, added (mg) Thiamin, intrinsic (mg)	
Vitamin B12	mcg	Vitamin B-12 (mcg)	Vitamin B12	Vitamin B12 (mcg)	Vitamin B-12 (mcg) Vitamin B-12, added (mcg) Vitamin B-12, intrinsic (mcg)	
Vitamin B2 - Riboflavin	mg	Riboflavin (mg)	Vitamin B2 - Riboflavin	Vitamin B2 - Riboflavin (mg)	Riboflavin (mg) Riboflavin, added (mg) Riboflavin, intrinsic (mg)	
Vitamin B3 - Niacin	mg	Nicin (mg)	Vitamin B3 - Niacin (mg) Niacin Equivalents (mg)	Vitamin B3 - Niacin (mg) Niacin Equivalents (mg)	Niacin (mg) Niacin from tryptophan, determined (mg) Niacin equivalent N406 +N407 (mg) Niacin, added (mg) Niacin, intrinsic (mg)	
Vitamin B6	mg	Vitamin B-6 (mg)	Vitamin B6 (mg)	Vitamin B6 (mg)	Vitamin B-6, pyridoxine, alcohol form (mg) Vitamin B-6, pyridoxal, aldehyde form (mg) Vitamin B-6, pyridoxamine, amine form (mg) Vitamin B-6, N411 + N412 +N413 (mg) Vitamin B-6 (mg)	
Vitamin C	mg	Vitamin C, Total ascorbic acid (mg)	Vitamin C (mg)	Vitamin C (mg)	Vitamin C, total ascorbic acid (mg) Vitamin C, reduced ascorbic acid (mg) Vitamin C, dehydro ascorbic acid (mg) Vitamin C, added (mg) Vitamin C, intrinsic (mg)	
Vitamin D	mcg	Vitamin D (mcg)	Vitamin D - IU (iu) Vitamin D - mcg (mcg)	Vitamin D (mcg)	Vitamin D (D2 + D3), International Units (iu) Vitamin D2 (ergocalciferol) (mcg) Vitamin D3 (cholecalciferol) (mcg) Vitamin D (D2 + D3) (mcg) Vitamin D4 (mcg)	
Vitamin E - Alpha-Toco	mg	Vitamin E (alpha-tocopherol) (mg)	Vitamin E - Alpha-Toco (mg)	Vitamin E - Alpha-Toco (mg)	Vitamin E (alpha-tocopherol) (mg) Vitamin E (label entry	

	Unit	ADAFSA - UAE	ADAFSA - UAE Recipes	ADAFSA - Kuwait	USDA - Legacy / USDA - Branded	
					primarily) (iu) Vitamin E (mg ATE) Vitamin E, added (mg) Vitamin E, intrinsic (mg)	
Vitamin K	mcg	Vitamin K (Phylloquinone) (mcg)	Vitamin K (mcg)		Vitamin K (Menaquinone-4) (mcg) Vitamin K (Dihydrophylloquinone) (mcg) Vitamin K (phylloquinone) (mcg)	
Water	g	Water (g)	Water (g)	Water (g)	Water (g)	
Zinc	mg	Zinc (mg)	Zinc (g)	Zinc (mg)	Zinc, Zn (mg)	

4. Observations, Questions & Pending Actions

Observation and questions relating to the preceding sections are listed below. Pending actions are recorded for each observation / question. Highlighted actions are pending with Aptiway.

#	Observation / Question	Feedback	Pending Actions
1	When a dataset specifies a nutrient in a unit that is different from the one used for analysis a conversion is required.	- kj to kcal - a constant conversion factor applies (1 kj = 0.2390057 kcal) - iu to mg - conversion factor varies between nutrients - iu to mcg - conversion factor varies between nutrients	iu to mg conversion factors to be provided for the following nutrients: - Vitamin E iu to mcg conversion factors to be provided for the following nutrients: - Vitamin A - Vitamin D
2	Two databases have missing nutrients: 1. **ADAFSA - Kuwait** - Caffeine - Monounsaturated Fat - Vitamin K 1. **ADAFSA - UAE** - Fat - Total Dietary Fiber	Where a nutrient is missing it will be treated as not analysed.	None
3	Some databases have multiple similarly named nutrients.	These cases represent the breakdown of different forms of the nutrient within the total. The form of the nutrient affects affects absorbtion/bio-availability.	Review the columns of the "Data Source Nutrient Mappings" table containing containing multiple nutrients to:

#	Observation / Question	Feedback	Pending Actions
			- Identify the nutrient that represents the total - Decide which nutrient forms other than the total will be included in the scope of analysis
4	In the USDA branded food database 818 foods have the same nutrient repeated two or more times, in some cases the amount of the nutrient differs. For example: "Chicken, CN FC Grilled Breast Nugget" has the nutrient 'Energy (Calories)' repeated two times with the following varying amounts: 134kcal and 224kcal.		Enquire with USDA regarding the reason for the difference. (Aptiway)
5	Food groups are only specified for the UAE recipes	Food groups have a lower priority than the nutritional and daily recommended intake analysis. And may be added as an enhancement. The pre-requisites for food group analysis are: - Ingredient list for each food - Classification of ingredients in terms of food group - Conversion method from ingredient portions to food group measurements	Enquire with USDA regarding the feasibility of identifying food groups and calculating intake values. (Aptiway)
6	The conversion factor for calculating calories from macronutrients for specific foods is only specified for legacy foods.	Where a conversion factor is not available a generic conversion factor will be used.	Generic conversion factors to be provided for each macronutrient.
7	The nutrient composition for food atlas foods is not provide.	The food atlas is primarily intended to support the selection of portion sizes by survey participants.	Food items from databases will where possible be mapped to the food atlas.
8	Portions are provided for food atlas food items but not other data sources.	For UAE/Kuwait databases: - where possible foods will be mapped to the food atlas - if not mapped to food atlas, provide generic measures (defaults to grams).	Enquire with USDA regarding branded food portion sizes. (Aptiway)
9	Recipes: nutritional composition is specified at the food level rather that the ingredient level.	***Option A:*** - where possible foods will be mapped to the food atlas - if not mapped to food atlas, provide generic measures (defaults to grams). ***Option A:*** - provide nutrients at the level of ingredients (potentially sourced from food atlas recipes).	Map foods to the atlas. Share food atlas recipes.

References

1. Photographic Atlas of Food Portions for the Emirate of Abu Dhabi
2. USDA Dataset Documnetation
3. USDA Dataset Downloads
4. Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Elements
5. Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Vitamins
6. Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Macronutrients