FDA U.S. FOOD & DRUG ADMINISTRATION
CENTER FOR FOOD SAFETY & APPLIED NUTRITION

U.S. Food & Drug Administration
Total Diet Study - Modernization

Terry Councell & Judi Spungen

U.S. FDA - Total Diet Study

- Initiated in 1961 and has been conducted continuously
- An important part of FDA's food safety and nutrition monitoring programs
- Monitoring focus on pesticide residues, elements (toxic and nutrient), radionuclides and mycotoxins
- Determines levels of the analytes in foods as they would be consumed (table-ready)

History of U.S. Total Diet Study

- 1961 – First TDS collection
  - 82 foods (composited)
  - Radionuclides, some pesticides, and vitamins
  - Population group – young men
- 1962 – Food group composites
- 1975 – Addition of infant/toddler foods
- 1982 – Foods individually analyzed
- 1991 – Quarterly collections/food list updated
- 2003 – Food list updated
- 2013 – TDS modernization started
- 2018 – New sampling plan

Modernizing the U.S. TDS

The goal is to enhance data quality and reduce uncertainty*

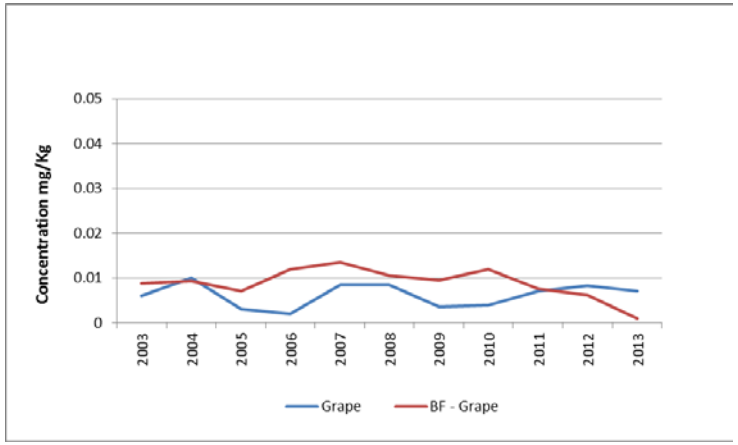
- Data management
- Methods/data quality standards
- Evaluation of sample collection plan
- Improve food list mapping (TDS linked with U.S. National Health and Examination Survey (NHANES) food consumption data)

*At the same funding level

Data Management

Centralized database for analytical results

- Elements, pesticides; flexibility to add additional analytes
- Efficient data storage (over 1 million records)
- Faster retrieval of information
- Rapid review/analysis (before: days; now: hours)
- Query and export data for further analysis
- Enhance visualization of data (graphs)



Analytical Methods/Data Quality Standards

- Reviewed analytical method validation data
  - Appropriate for use (wide variety of food items)
- Standardized protocol for LOD/LOQ determination
  - Lower detection limits than methods used for assessing compliance
- Data analysis (data sets with many non-detects)
  - Exploring new modeling approaches

TDS Analytes

- Elements (25)
  - Arsenic speciation in select foods and beverages
- Pesticides (~300)
- Radionuclides (3)
  - Regional foods
- Mycotoxins (10)
  - Select foods

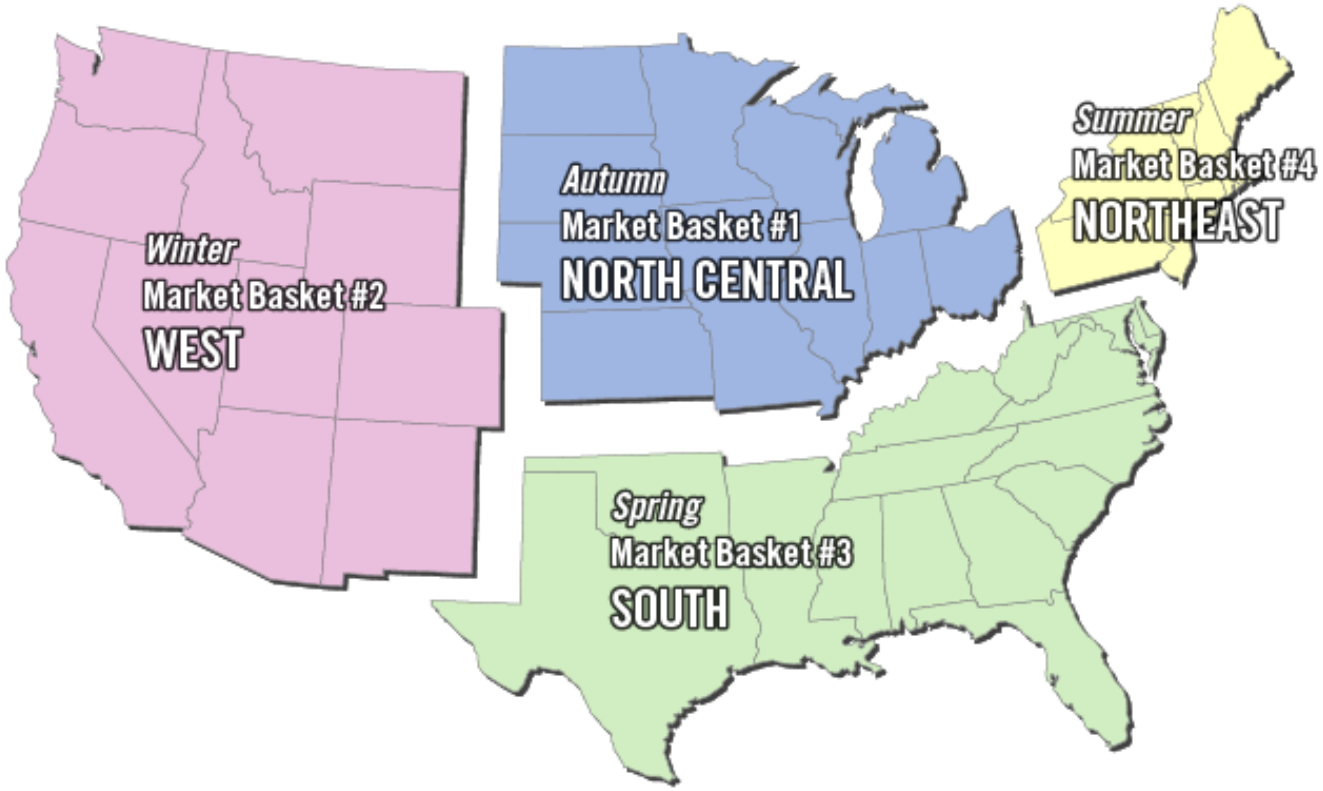
Evaluation of 1991 – 2017 Sample Collection Plan

- Understand the limitations of the current TDS sampling plan
- Evaluate options to enhance the sampling plan
  - Capture seasonal changes throughout the year
  - Capture regional differences
  - Food list (regional/national food items)
  - Population based vs. convenience sampling

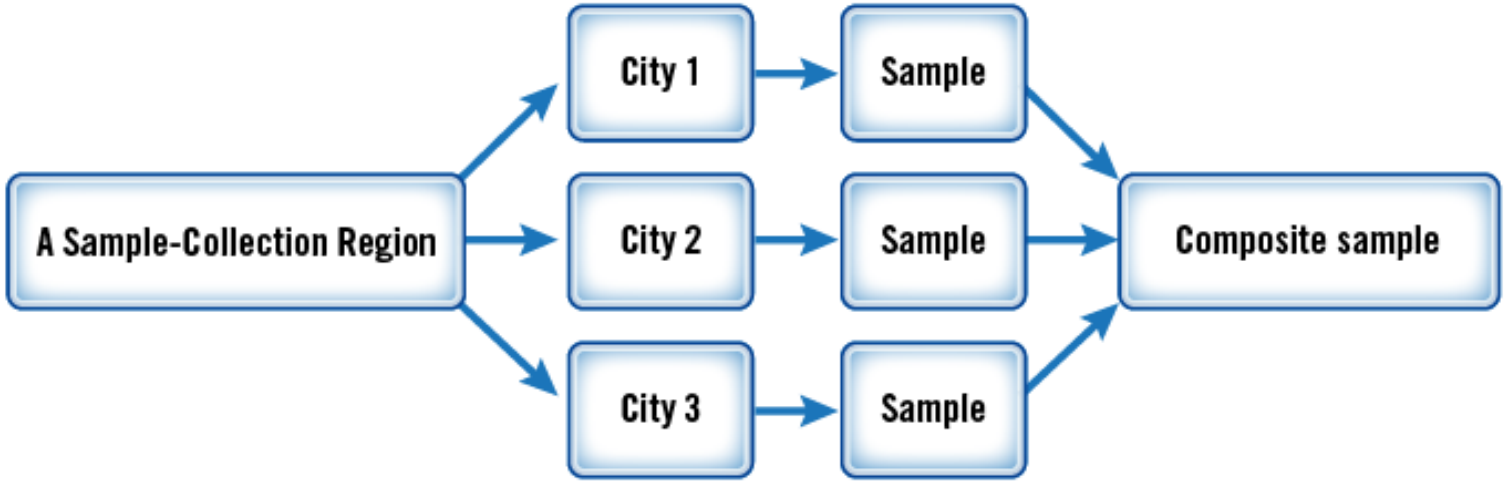
Study Design (1991-2017)

- Four regions (Northeast, South, North Central & West)
- Food items were collected from each regions during the same quarter, or season, each year
- Every TDS food was purchased in each quarter
  - Supermarkets, grocery stores, and fast food restaurants
  - Three different cities in each region were combined to form a single analytical sample
  - Foods were prepared table-ready
- Selection of food retailers at the discretion of the FDA staff collecting the food items
- Non-specific description of food items requirements (fresh/frozen, flavors)
- Each quarterly collection was a Market Basket

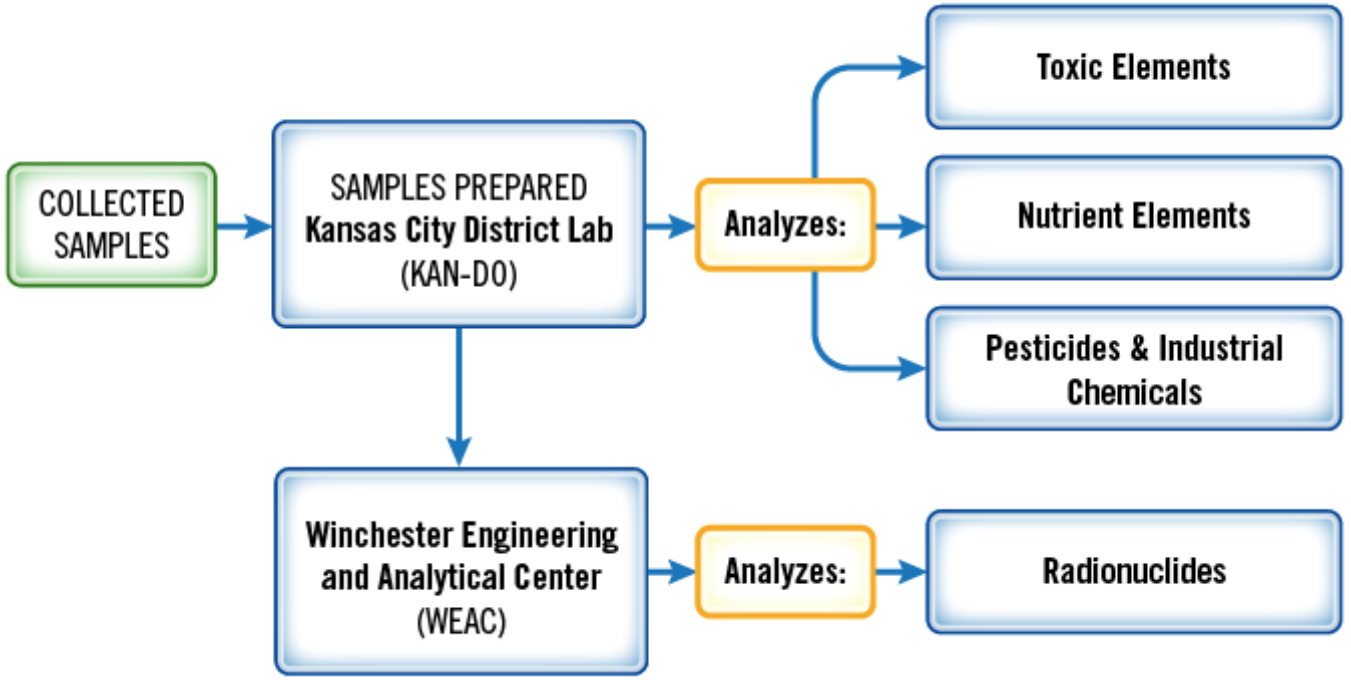
Study Design (1991-2017)



Composite Study Design (1991-2017)



Study Design (1991-2017)



Decision - Sampling Plan Design (2018-present)

- Increase from 4 to 6 collection regions
  - One market basket = 2 years
- Population-based (probability proportional to size)
- Regional and National Food Lists
  - Regional foods expected to be affected by environmental factors
  - National foods brand selected based on market share
- Inclusion of seasonality
  - Each food item sampled in each region in winter and in summer

Regions (2018-present)

Population Based Sample (2018-present)

Stratify by Region

- Six regions with populations ranging between 50 and 55 million
- Within each region
  - Sort the list of counties by USDA's Urban Influence Codes (UIC) and population size
  - Random sampling with probability minimal replacement and probability proportional to the population
  - Select six counties in each region yearly

Population Based Sampling (2018-present)

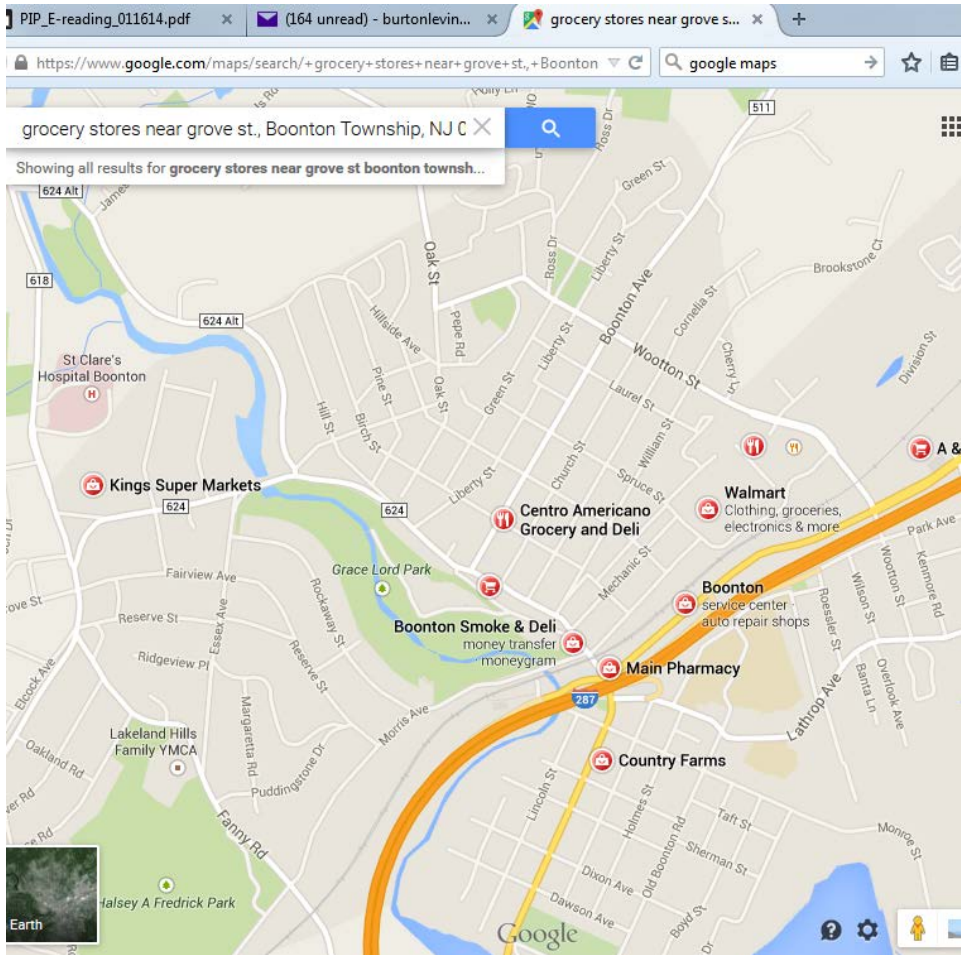
Code	UIC Description	Number of Counties	2010 Population
Metropolitan Counties		**1,167**	**262,452,132**
1	In large metro area of 1+ million residents	432	168,523,961
2	In small metro area of less than 1 million residents	735	93,928,171
Nonmetropolitan Counties		**1,976**	**46,293,406**
3	Micropolitan area adjacent to large metro area	130	7,190,190
4	Noncore adjacent to large metro area	149	3,243,787
5	Micropolitan area adjacent to small metro area	242	11,180,286
6	Noncore adjacent to small metro area and contains a town of at least 2,500 residents	344	7,290,442
7	Noncore adjacent to small metro area and does not contain a town of at least 2,500 residents	162	1,576,041
8	Micropolitan area not adjacent to a metro area	269	8,783,737
9	Noncore adjacent to micro area and contains a town of at least 2,500 residents	184	2,798,944
10	Noncore adjacent to micro area and does not contain a town of at least 2,500 residents	189	1,347,344
11	Noncore not adjacent to metro or micro area and contains a town of at least 2,500 residents	125	1,959,311
12	Noncore not adjacent to metro or micro area and does not contain a town of at least 2,500 residents	182	923,324
Total U.S.		**3,143**	**308,745,538**

Population Based Sample (2018-present)

Selection of Food Retailer

- Household selection
  - Randomly select a household using the U.S. Postal Delivery Sequence file
  - Using Google Maps
    - Map the household
    - Determine the nearest six food retailers

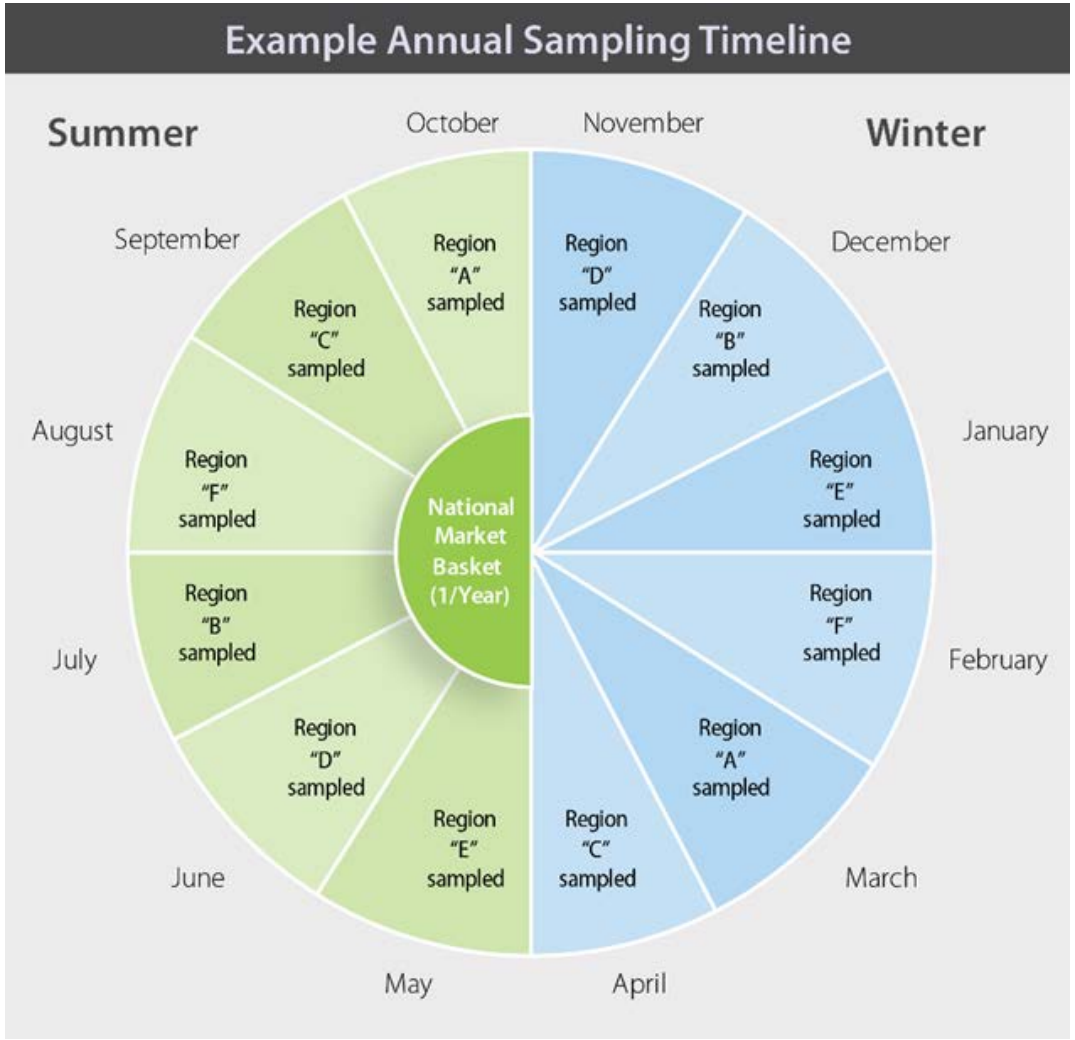
Population Based Sampling (2018-present)



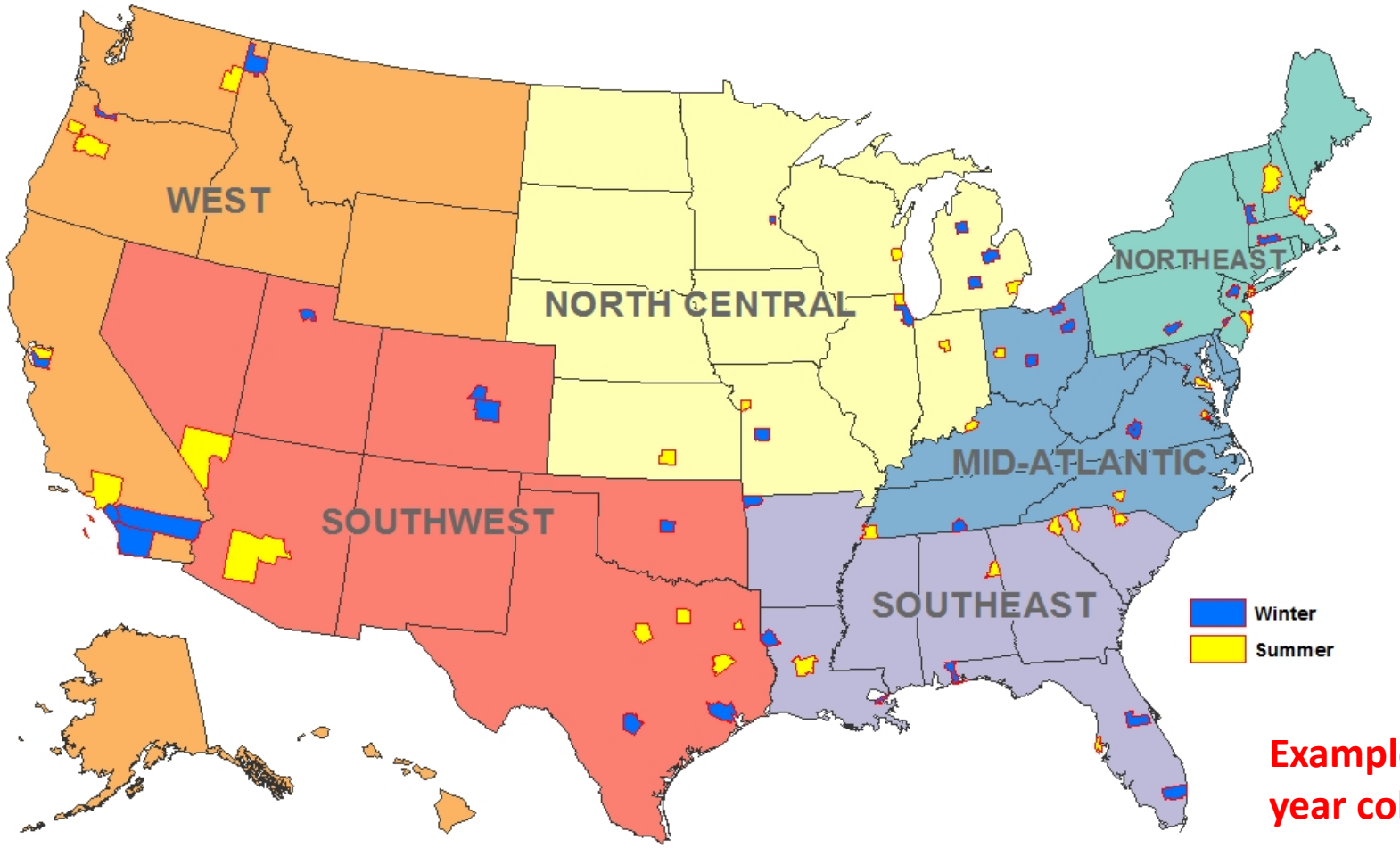
Groove St., Boonton Township, NJ, an address in Morris County, New Jersey

- Six food retails outlets nearest the address
  - King Super Markets
  - Centro Americano Grocery & Deli
  - Mediterranean Snacks
  - Boonton Smoke & Deli
  - Walmart
  - A&P Food Store

Seasonal Plan (2018-present)



Population Based Sampling (2018-present)



Example of locations One-year collection period

Current Market Basket (2018-present)

Market Basket – 2 year collection period

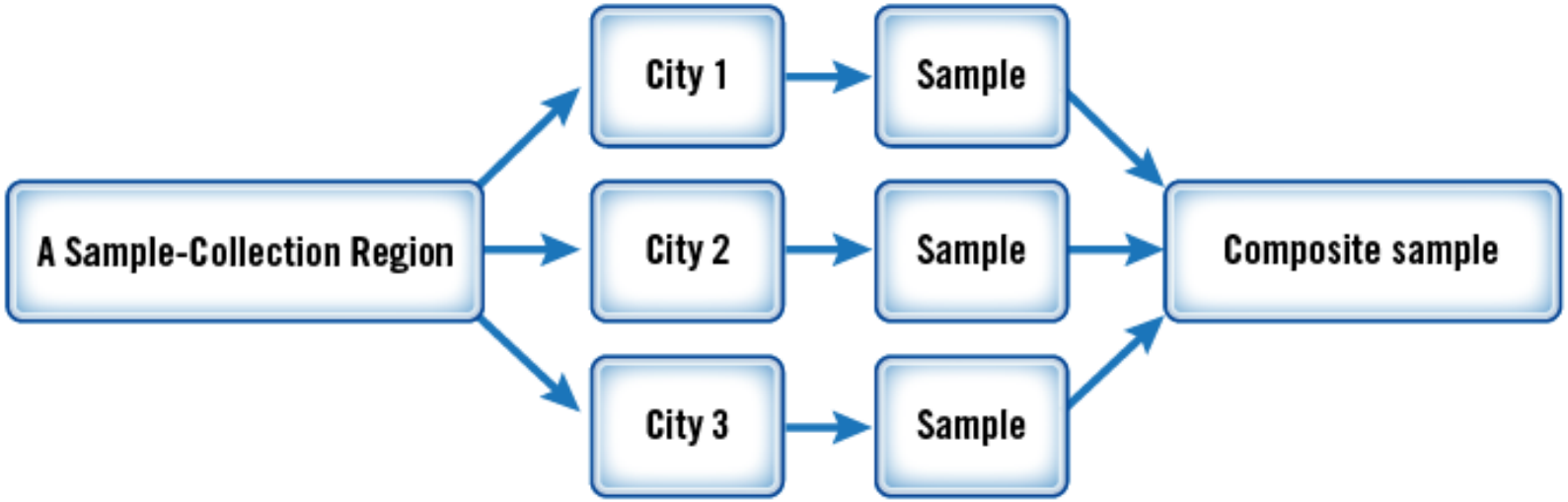
24 regional collections (6 regions x 2 seasons x 2 years)

- 93 foods collected in 3 cities per regional collection
- 3 samples (cities) per food are composited for analysis

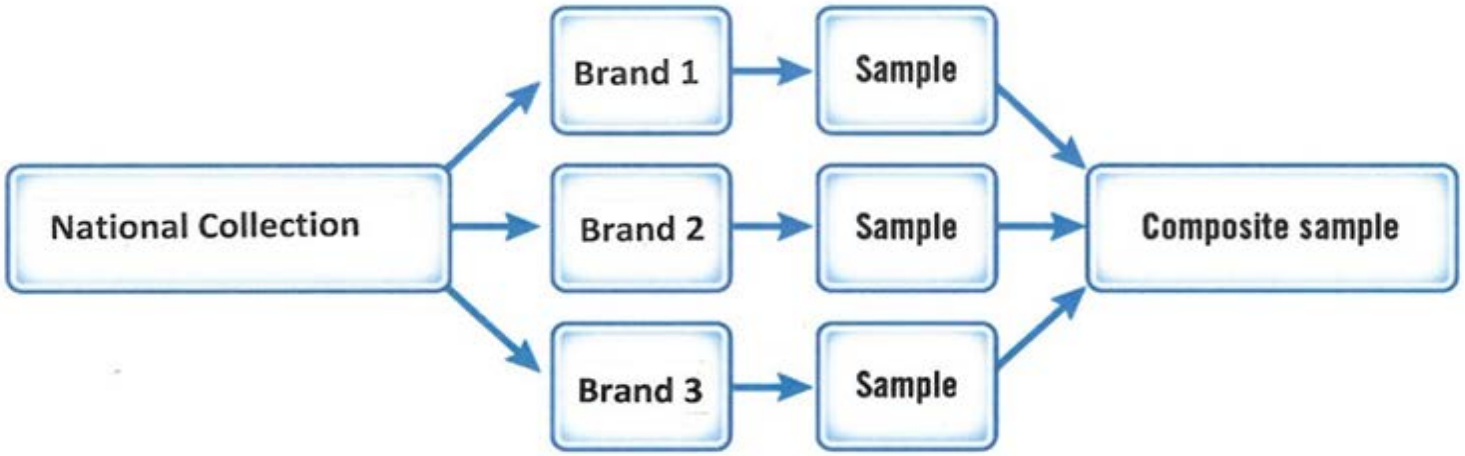
2 national collections (1 per year)

- 172 foods collected from a single location
- Multiple brands composited for analysis (accounts for +50% market share)

Composite Regional Collection

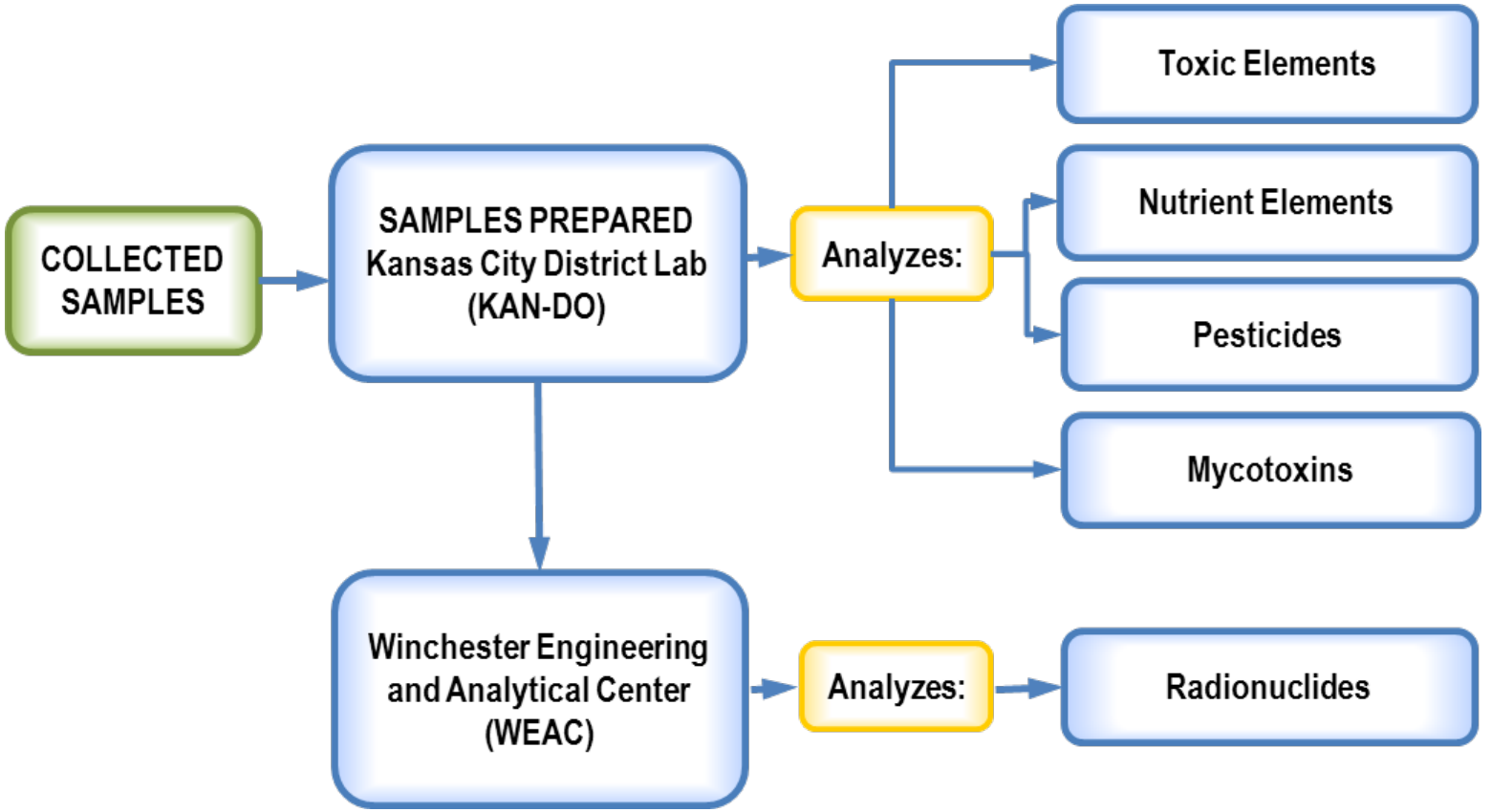


Composite National Collection



Accounts for +50% of market share or up to 3 brands for composite

Study Design (2018-present)



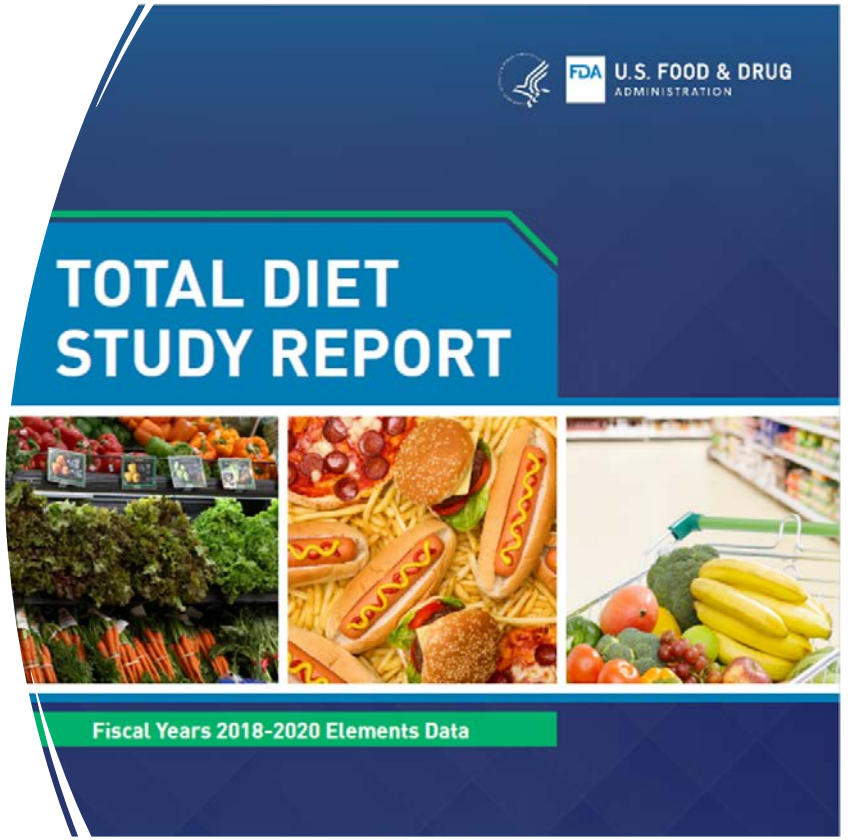
Current Food List (2018-present)

- Based on 2013-2014 National Health and Nutrition Examination Survey (NHANES) What We Eat In America (WWEIA) data
- More specificity
- Sales data
  - Nielsen
  - IRI

Recent TDS Data and Report

- Updated Web Pages with modernization
- Elements Data available 2018-2020
- Report on the Elements data 2018-2020

Data and reports for pesticides and radionuclides to follow



https://www.fda.gov/food/science-research-food/fda-total-diet-study-tds

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Exposure Assessments Based on U.S. TDS Data

Examples of Recent TDS-based Exposure Assessments

Journal of Exposure Science and Environmental Epidemiology (2016) 00, 1–10

www.nature.com/jes

ORIGINAL ARTICLE

Update on dietary intake of perchlorate and iodine from U.S. food and drug administration's total diet study: 2008–2012

Eileen Abt, Judith Spungen, Régis Pouillot, Margaret Gamalo-Siebers[1] and Mark Wirtz

The U.S. Food and Drug Administration's (FDA) Total Diet Study (TDS) monitors the US food supply for pesticide residues, industrial chemicals, radionuclides, nutrients, and toxic elements. Perchlorate and iodine intakes based on concentrations in TDS samples collected between 2008 and 2012 were estimated in order to update an earlier TDS dietary assessment. Perchlorate is used as an oxidizing agent in rocket and missile fuel, is formed naturally in the atmosphere, and occurs naturally in some soils. Because of perchlorate's presence in soil, and in irrigation, processing, and source water, it is widely found in food. Iodine was included in the study because perchlorate at high doses interferes with iodide uptake in the thyroid. Iodine (the elemental form of iodide) is essential for growth and development, and metabolism. This study uses a novel statistical method based on a clustered zero-inflated lognormal distribution model to estimate mean and 95th percentile confidence interval concentrations for perchlorate and iodine in US foods. These estimates were used to estimate mean perchlorate and iodine exposures for the total US population and for 14 age/sex groups in the US population. Estimated mean perchlorate intake for the total US population was 0.13 μg/kg bw/day, with mean intakes for the 14 age/sex groups between 0.09 and 0.43 μg/kg bw/day. The estimated mean intakes of perchlorate for all age/sex groups were below EPA's reference dose (RfD) of 0.7 μg/kg bw/day. The estimated mean iodine intake for the total US population was 216.4 μg/person/day, with mean intakes ranging from 140.9 to 296.3 μg/person/day for the 14 age/sex groups, with all age/sex groups exceeding their respective estimated average requirements (EARs).

Comparison of 2 methods for estimating the prevalences of inadequate and excessive iodine intakes[1–3]

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ABSTRACT

Background: Prevalences of iodine inadequacy and excess are usually evaluated by comparing the population distribution of urinary iodine concentration (UIC) in spot samples with established UIC cutoffs. To our knowledge, until now, dietary intake data have not been assessed for this purpose.

Objective: Our objective was to compare 2 methods for evaluating the prevalence of iodine inadequacy and excess in sex- and life stage–specific subgroups of the US population: one that uses UIC iodine concentrations (UICs)[9] in spot samples with established cutoffs for median UIC concentrations in sex- and life stage–specific population subgroups, such as those developed by the WHO (1). To our knowledge, until now, the use of dietary intake data for this purpose has not been assessed.

Because UIC mostly reflects recent iodine intake, large day-to-day variability in iodine intake is reflected in large day-to-day variability in UIC (2). For that reason, as discussed elsewhere in this supplement issue, UIC measured in spot samples or single

Lead exposures in older children (males and females 7–17 years), women of childbearing age (females 16–49 years) and adults (males and females 18+ years): FDA total diet study 2014–16

Alexandra Gavelek, Judith Spungen, Dana Hoffman-Pennesi, Brenna Flannery, Laurie Dolan, Sherri Dennis & Suzanne Fitzpatrick

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Taylor & Francis

Children's exposures to lead and cadmium: FDA total diet study 2014-16

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ABSTRACT

Children are at potential risk for adverse effects from lead and cadmium exposures due to the effects of these elements on developing brains. Children's dietary exposures to lead and cadmium were estimated based on lead and cadmium concentration data from FDA's Total Diet Study (TDS) and on food consumption data from What We Eat in America (WWEIA), the food survey portion of the National Health and Nutrition Examination Study (NHANES). Estimated mean exposures vary based on age range (1–3 y, 4–6 y, or 1–6 y) and on substitution scenarios for values below the limit of detection (non-detects = 0; non-detects = limit of detection; hybrid approach). Estimated mean lead exposures range from 1 to 3.4 μg/day, with major contributions from grains, fruit, dairy, and mixtures (e.g. hamburgers, pizza, lasagna, soups). Estimated mean cadmium exposures range from 0.38 to 0.44 μg/kg bw/day, with major contributions from grains, mixtures, and vegetables. Estimated children's lead exposures declined slightly since 2004–08, but cadmium exposures did not decline. No safe level has been identified for lead exposures, and toxicologic reference values for cadmium range from 0.1 to 0.83 μg/kg bw/day. The data on lead and cadmium exposures, and on contributors to exposures, will inform research and regulatory priorities on mitigation of exposures to lead and

ARTICLE HISTORY
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KEYWORDS
Lead; cadmium; children; exposure assessment; total diet studies

TDS-based exposure assessment: considerations

- Treatment of constituent concentration values < limit of detection
- Mapping of TDS constituent data to consumption data

TDS-based exposure assessment: considerations

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- Mapping of constituent data to consumption data

Treatment of constituent concentration values < limit of detection (LOD) in calculating central tendency statistics

Options:

- Lower bound (ND=0) **(*recommended by WHO*)**
- Middle bound (ND= 0.5*LOD)
- Upper bound (ND=LOD) **(*recommended by WHO*)**
- Hybrid (ND=0 for foods with 100% ND; ND=0.5*LOD or ND=LOD for other foods) **(*approach used by EPA-ORD for lead analysis*)**

TDS-based exposure assessment: considerations

- Treatment of constituent concentration values < limit of detection

- Mapping of TDS constituent data to consumption data

U.S. food consumption data source:

National Health and Nutrition Examination Surveys (NHANES)

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National Health and Nutrition Examination Surveys (NHANES)

Dietary portion:

“What We Eat In America” (WWEIA)

National Health and Nutrition Examination Surveys (NHANES)

- Nationally representative samples drawn and fielded for two-year cycles, beginning in 1999

Dietary portion: “What We Eat In America” (WWEIA)

- Since 2003, two 24-hour recalls conducted 3 – 10 days apart
- Dietary data available for about 8000 respondents for every two-year NHANES/WWEIA cycle
- >10,00 different food codes reported, 1999-2018
- Nutrient concentrations in each food have been measured or estimated based on “recipes” from the USDA Food and Nutrient Database for Dietary Studies (FNDDS)

System for estimating TDS-based nutrient/contaminant concentrations in NHANES/WWEIA foods (1991-2017)

- Not based on use of recipes
- Instead, each of the ~260-280 TDS foods was “mapped” to one or more NHANES/WWEIA foods.
- Mapping was based on major ingredient(s), not packaging or other attributes
- Values for each TDS index food were assumed to apply to all NHANES/WWEIA foods to which the TDS food is mapped.

2003-2017 mapping of TDS concentration data to NHANES/WWEIA consumption data:

Examples

NHANES/WWEIA code	NHANES/WWEIA description	TDScod	TDSdesc
63105010	AVOCADO, RAW	97	Avocado, raw
63408010	GUACAMOLE W/ TOMATOES	97	Avocado, raw
63408200	GUACAMOLE W/ TOMATOES & CHILI PEPPERS	97	Avocado, raw
63409010	GUACAMOLE, NFS	97	Avocado, raw

2003-2017 mapping of TDS concentration data to NHANES/WWEIA consumption data: Examples

NHANES/WWEIA code	NHANES/WWEIA description	TDScode	TDSdesc
26319110	SHRIMP, COOKED, NS AS TO COOKING METHOD	244	Shrimp, boiled
26319120	SHRIMP, BAKED OR BROILED (INCL SAUTEED; PRAWN)	244	Shrimp, boiled
26319121	Shrimp, baked or broiled, made with butter	244	Shrimp, boiled
26319122	Shrimp, baked or broiled, made with margarine	244	Shrimp, boiled
26319123	Shrimp, baked or broiled, made without fat	244	Shrimp, boiled
26319124	Shrimp, baked or broiled, made with cooking spray	244	Shrimp, boiled
26319130	SHRIMP, STEAMED OR BOILED	244	Shrimp, boiled
26319170	SHRIMP, DRIED	244	Shrimp, boiled
26319180	SHRIMP, CANNED	244	Shrimp, boiled
26321110	SNAILS, COOKED, NS AS TO METHOD	244	Shrimp, boiled
27150020	CRAB, DEVILED	244	Shrimp, boiled
27150030	CRAB IMPERIAL (INCLUDE STUFFED CRAB)	244	Shrimp, boiled
27150060	LOBSTER NEWBURG (INCLUDE LOBSTER THERMIDOR)	244	Shrimp, boiled
27150070	LOBSTER W/ BUTTER SAUCE (INCLUDE LOBSTER NORFOLK)	244	Shrimp, boiled
27150100	SHRIMP, CURRIED	244	Shrimp, boiled

2003-2017 mapping of TDS concentration data to NHANES/WWEIA consumption data: Examples

NHANES/WWEIA code	NHANES/WWEIA description	TDScod	TDSdesc
26119160	HERRING, PICKLED, IN CREAM SAUCE	272	Tuna noodle casserole, homemade
27150010	FISH W/ CREAM OR WHITE SAUCE, NOT TUNA	272	Tuna noodle casserole, homemade
27150120	TUNA W/ CREAM OR WHITE SAUCE	272	Tuna noodle casserole, homemade
27250030	CODFISH BALL OR CAKE	272	Tuna noodle casserole, homemade
27250124	Shrimp and noodles with (mushroom) soup	272	Tuna noodle casserole, homemade
27250126	Shrimp and noodles with cream or white	272	Tuna noodle casserole, homemade
27250130	SHRIMP & NOODLES W/ CHEESE SAUCE	272	Tuna noodle casserole, homemade
27250150	TUNA LOAF	272	Tuna noodle casserole, homemade
27250160	TUNA CAKE OR PATTY	272	Tuna noodle casserole, homemade
27250250	FLOUNDER W/CRAB STUFFING	272	Tuna noodle casserole, homemade
27250610	TUNA NOODLE CASSEROLE W/ CREAM OR	272	Tuna noodle casserole, homemade
27250630	TUNA NOODLE CASSEROLE W/ (MUSHROOM)	272	Tuna noodle casserole, homemade
27250710	TUNA & RICE W/ (MUSHROOM) SOUP	272	Tuna noodle casserole, homemade
27250820	FISH & RICE W/ CREAM SAUCE	272	Tuna noodle casserole, homemade
27250830	FISH & RICE W/ (MUSHROOM) SOUP	272	Tuna noodle casserole, homemade

New Mapping Approach for Food Mixtures

New Mapping Approach for Food Mixtures

Map TDS data to some NHANES/WWEIA codes based on "recipes," with TDS foods as the ingredients, to mathematically estimate contaminant concentrations

NHANES/WWEIA food examples		**Map based on %'s of:**
32202010	Egg, cheese, and ham on English muffin	Egg, cheese, ham, English muffin
58130016	Lasagna w/meat, frozen	Pasta, ground beef, mozzarella cheese, tomato sauce
27540280	Chicken fillet, broiled, sandwich with cheese, on bun, with lettuce, tomato and spread	Chicken, cheese, lettuce, tomato, bun, spread
27250630	Tuna noodle casserole with (mushroom) soup	Tuna, noodles, mushroom soup

USDA Nutrient Concentration Data for NHANES/WWEIA Foods:

Example of data calculated based on a recipe from the USDA Food and Nutrient Database for Dietary Studies (FNDDS):

Food code	Description	Protein	Fat	CHO	H2O	Sugars	TDF	Kcal		
71603010	Potato salad, made with mayonnaise	g/100 g food								
		1.52	11.14	15.8	70.34	1.28	1.5	168		
		Ca	Fe	Mg	P	K	Na	Zn	Cu	Se
		mg/100 g food								mcg/100 g food
		10	0.31	16	36	261	178	0.24	0.131	1.1
		plus concentration data on vitamins, amino acids, fatty acids, cholesterol, caffeine, etc.								

Calculation of Nutrient Concentrations Using Recipes from the USDA Food and Nutrient Database for Dietary Studies (FNDDS): Example

FNDDS recipe for 71603010: Potato salad, made with mayonnaise						Nutrients/100 g ingredient			
						Protein	Fat	Ca	Fe
Ing code	Ingredient description	Amount	Measure	G	%	g		mg	
11367	Potatoes, boiled, cooked without skin, flesh, without salt	835	GM	835	74.4	1.71	0.1	8	0.31
11143	Celery, raw	1		40	3.6	0.69	0.17	40	0.2
11282	Onions, raw	2	TB	20	1.8	1.1	0.1	23	0.21
2046	Mustard, prepared, yellow	1	TB	15.625	1.4	3.74	3.34	63	1.61
2053	Vinegar, distilled	2	TB	30	2.7	0	0	6	0.03
11945	Pickle relish, sweet	1	TB	15.313	1.4	0.37	0.47	3	0.87
4025	Salad dressing, mayonnaise, regular	0.75	C	165	14.7	0.96	74.85	8	0.21
2047	Salt, table	0.25	TS	1.5	0.1	0	0	24	0.33
						Nutrients/100 g food			
			Total	1122.44	100	1.51	11.14	10	0.34

Mapping TDS to NHANES/WWEIA foods
Examples

Mapping based on the Food and Nutrient Database for Dietary Studies (FNDDS) "recipe" for 14640000 Cheese sandwich, not further specified:

FNDDS recipe		
NDB #		%
1252	Cheese product, pasteurized process, American	41.2
18069	Bread, white, commercially prepared	58.8

Proposed new mapping		
TDS no	TDS desc	%
10	Cheese, American, processed	41.2
58	Bread, white, enriched, pre-sliced	58.8

Mapping TDS to NHANES/WWEIA foods
Examples

Mapping based on the FNDDS “recipe” for 27516010 Gyro sandwich (pita bread, beef, lamb, onion, condiments), with tomato and spread):

FNDDS recipe				Proposed new mapping		
NDB #		%		TDS no	TDS desc	%
1256	Yogurt, Greek, plain, nonfat	8.6		522	Yogurt, lowfat, vanilla	8.6
4053	Oil, olive, salad or cooking	2.0		378	Oil, olive	2.0
11206	Cucumber, peeled, raw	5.0		123	Cucumber, peeled, raw	5.0
11282	Onions, raw	9.4		128	Onion, mature, raw	9.4
11529	Tomatoes, red, ripe, raw, year round average	15.6		117	Tomato, raw	15.6
17042	Lamb, domestic, shoulder, whole (arm and blade	14.8		27	Lamb chop, pan-cooked with oil	14.8
18041	Bread, pita, white, enriched	29.7		58	Bread, white, enriched, pre-sliced	29.7
23588	Beef, top sirloin, steak, separable lean only, trim	14.9		334	Beef steak, loin/sirloin, broiled	14.9

Mapping to TDS
where no usable recipe exists in FNDDS

Developing a "recipe" for mapping to TDS where no usable recipe exists in FNDDS

NHANES/WWEIA # 32202010 *Egg, cheese, and ham on English muffin*

The FNDDS "recipe" for this item is a one-to-one match with the following NDB #:

		Nutrients per 100 g							
NDB #	NDB Description	Protein	Fat	Carb	Energy	Moisture	Sugars	Fiber	Sodium
		g	g	g	kcal	g	g	g	mg
21021	Fast foods, english muffin, with egg, cheese, and canadian bacon	13.6	9.7	21.7	228.0	52.6	2.1	0.4	617

We developed the following recipe:

Ingredient	Quantity	g
English muffins, plain, toasted, enriched, with calcium pr	1 muffin	57
Egg, fried	1 egg	46
Canadian bacon	1 slice	13.8
Cheese, pasteurized process American	1 slice	28
Margarine	?	
Salt	?	

Developing a "recipe" for mapping to TDS where no usable recipe exists in FNDDS, continued

We adjusted the recipe to 100% (margarine and salt = 0% for first pass) and totaled the nutrient contributions to determine how closely the totals matched the SR nutrient contents:

NDB #	Ingredient	Percent	Protein g	Fat g	Carb g	Energy kcal	Moisture g	Sugars g	Fiber g	Sodium mg
18259	English muffins, plain, toasted, enriched, with calcium pr	39.4	10.3	2.0	52.7	270.0	33.0	3.5	2.8	477
1129	Egg, whole, cooked, hard-boiled	31.8	12.6	10.6	1.1	155.0	74.6	1.1	0.0	124
10131	Pork, cured, canadian-style bacon, grilled	9.5	24.2	8.4	1.4	185.0	61.7	0.0	0.0	1546
1253	Cheese, pasteurized process, American	19.3	18.1	31.8	3.7	371.0	39.6	2.3	0.0	1671
4610	Margarine, regular, 80% fat, composite, stick, with salt	0.0	0.2	80.7	0.7	717.0	16.5	0.0	0.0	751
2047	Salt, table	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	38758
	TotalCalc	100.0	13.9	11.1	21.9	244.9	50.2	2.2	1.1	698
21021	Fast foods, english muffin, with egg, cheese, and canadian bacon		13.6	9.7	21.7	228.0	52.6	2.1	0.4	617

Even without margarine or salt, the calculated total fat exceeds the analyzed total fat, and the analyzed total sodium exceeds the analyzed total sodium, so we left these two ingredients out of the recipe.

Summary of Changes

Sample Collection Plan	
Previous (1991-2017)	Current
4 market basket collections per year	1 market basket collected every 2 years
4 regions	6 regions
1 food list (~270 items)	2 food lists – Regional (93 items) National (172 items)
4 collections per year	13 collection per year 12 regional (monthly) 1 – national
Convenience based sampling	Population based sampling
General shopping instructions	Specific shopping instructions (brands, flavors, types)
Exposure Assessment	
Mapping of mixtures (multi-ingredient foods) – based on similarity of major ingredients	Mapping of mixtures (multi-ingredient foods) – based on recipes

Iodine Intake/Exposure Project

- Collaboration with USDA Agricultural Research Service, NIH Office of Dietary Supplements, and CDC
  - Development of iodine composition database combining TDS and USDA data
  - Mapping of iodine composition data to NHANES/WWEIA data (2003-2018)
    (Modification of TDS-based mapping)
  - Planned analyses: CDC will estimate iodine intakes (including intakes from supplements) for 2014 subsample with 24-hour urine data, and compare intakes with UIC data; iodine intakes for the total population will also be estimated.

Uses of TDS Data

- Provide background/baseline for safety assessments
- Signal potential safety concerns
- Risk assessments
- Monitor contaminant/exposure trends over time
- Resource prioritization
- Important part of a food safety program
  - FDA Center for Food Safety & Applied Nutrition's - Toxic Elements Working Group

FDA's Closer to Zero Action Plan

Identifies actions the agency will take to reduce exposure to arsenic, lead, cadmium, and mercury from foods eaten by babies and young children—to as low as possible.

Reductions in the levels of arsenic, lead, cadmium, and mercury in foods will be made by:

- advancing the FDA's research on and evaluating changes in dietary exposures to these elements,
- setting action levels, with input from stakeholders,
- encouraging adoption of best practices by industry to lower levels of toxic elements in agricultural commodities and products,
- increasing targeted compliance and enforcement activities, and
- monitoring progress of levels over time.

Where Can You Find More Information?

- Website: https://www.fda.gov/Food/FoodScienceResearch/TotalDietStudy/default.htm

- Email: TDS@fda.hhs.gov

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FDA – Office of Regulatory Affairs (ORA)

Kansas City Laboratory
- Coordinate field operations
- Sample receipt/preparation
- Sample analysis (elements/pesticides/mycotoxins)

ORA Field Operations (sample collectors)
Winchester Engineering and Analytical Center (radionuclides)

QUESTIONS?