

# DIET ID IN RESEARCH: VALIDATION, DATA, AND IMPLICATIONS FOR ASSESSING DIET QUALITY

April 26, 2023



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# Dietary Assessment in the BRIE Lab

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Public Health**



Overview

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- Meet the BRIE Lab
- BRIE Lab studies using dietary assessment
- Current use of Diet ID
- Dietary self-monitoring

Meet the  
BRIE Lab

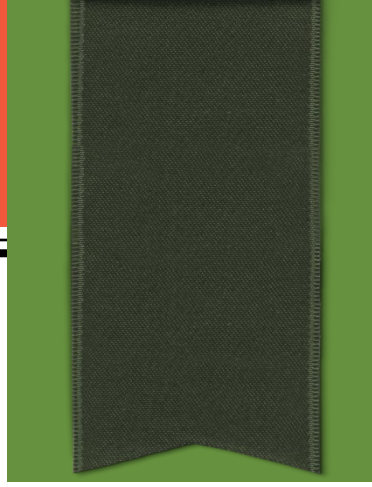
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BRIE Lab team!

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NUTRITIOUS EATING  
WITH (NEW) SOUL  
STUDY



NUTRITIOUS EATING

WITH SOUL STUDY

## Purpose of this study

- In the US, African Americans have the highest rates of obesity and heart disease as compared with whites and Hispanics.
- African Americans are underrepresented in nutrition research.
- Research has shown that African American vegetarians/vegans have significantly lower risk of hypertension, diabetes, cancer and high total and LDL cholesterol.
- Objective: Compare two different soul food dietary approaches on the reduction of body weight and CVD risk factors.

# Two-year intervention

- Low-fat omnivorous soul food diet



- Low-fat plant-based soul food diet





# What is soul food?

- Soul food is the term used to describe the ethnic cuisine that enslaved Africans prepared in the Southern United States to survive during slavery
- Common soul foods: collard greens, cornbread, pulled pork, and fried chicken, etc.
- Vegan soul food?





# What does NEW Soul entail?

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- Group meetings for 2 cohorts -2 years each:
  - Cooking demos
  - Hands-on cooking practice
  - Physical activity info and demonstrations
  - Nutrition information
  - Fun!
- Meet weekly for 6 months
- Meet every other week for months 7-12
- Meet monthly from months 13-24

# Some of the NEW Soul papers

- Turner-McGrievy G, et al. The Nutritious Eating with Soul (NEW Soul) Study: Study design and methods of a two-year randomized trial comparing culturally adapted soul food vegan vs. omnivorous diets among African American adults at risk for heart disease. *Contemp Clin Trials*. 2020 Jan;88:105897.
- Bernhart JA, et al. Sensor-measured physical activity is associated with decreased cardiovascular disease risk in African Americans. *Lifestyle Medicine*. 2020; 1:e16.
- Turner-McGrievy GM, et al. Effective recruitment strategies for African American men and women: The Nutritious Eating with Soul study. *Health Education Research*. 2021 Apr 12;36(2):206-211.
- Okpara N, et al. "Food doesn't have power over me anymore!" Self-Efficacy as a Driver for Dietary Adherence among African American Adults Participating in Plant-Based and Meat-Reduced Dietary Interventions: A Qualitative Study. *Journal of the Academy of Nutrition and Dietetics*. 2022 Apr;122(4):811-824
- Bernhart JA, et al. Physical Activity Assessment in African Americans Participating in a Dietary Weight Loss Trial Focused on Soul Food. *Journal of Public Health*. <https://doi.org/10.1007/s10389-021-01666-z>
- Turner-McGrievy GM, et al. Comparison of the Diet ID platform to the Automated Self-Administered 24-Hour (ASA24) Dietary Assessment Tool for assessment of dietary intake. *Journal of the American College of Nutrition*. 2022 May-Jun;41(4):360-382.
- Turner-McGrievy GM, et al. Effect of a Plant-Based vs Omnivorous Soul Food Diet on Weight and Lipid Levels Among African American Adults: A Randomized Clinical Trial. *JAMA Network Open*. 2023;6(1):e2250626.



Journal of the American College of Nutrition

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/uacn20>

## Comparison of the Diet ID Platform to the Automated Self-administered 24-hour (ASA24) Dietary Assessment Tool for Assessment of Dietary Intake

Gabrielle Turner-McGrievy, Brent Hutto, John A. Bernhart & Mary J. Wilson

To cite this article: Gabrielle Turner-McGrievy, Brent Hutto, John A. Bernhart & Mary J. Wilson (2021): Comparison of the Diet ID Platform to the Automated Self-administered 24-hour (ASA24) Dietary Assessment Tool for Assessment of Dietary Intake, Journal of the American College of Nutrition, DOI: [10.1080/07315724.2021.1887775](https://doi.org/10.1080/07315724.2021.1887775)

To link to this article: <https://doi.org/10.1080/07315724.2021.1887775>

# Challenges we've encountered with dietary assessment

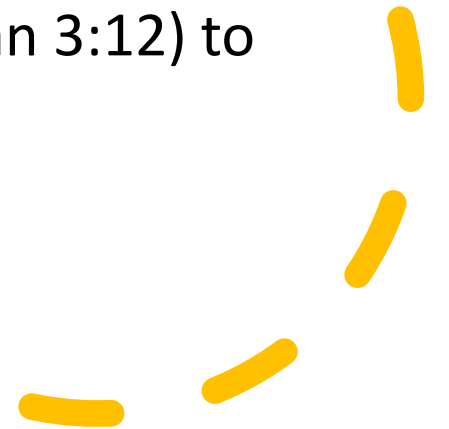
- Multiple dietary recalls (2 weekdays and 1 weekend day) is burdensome on participants and staff
- Requires both computer and literacy skills
  - Misspell words and you won't find what you're looking for
- Moving into the field from a more controlled academic setting required an easier and faster way to assess diet



**Results:** Nutrients from the Diet ID were generally higher than the 24HR except for the Healthy Eating Index (HEI) score ( $69.6 \pm 12.2$  ASA24 vs  $51.1 \pm 34.5$  Diet ID). Diet ID reported 950 kcals higher energy intake than ASA24, with the difference being most pronounced at lower ASA24-reported energy intake. There were significant correlations among measures for HEI score, protein, carbohydrates, cholesterol, potassium, copper, thiamin, and vitamins B12 and E. There was higher reporting of nutrients using Diet ID compared to the 24HR. Diet ID is a rapid way to assess dietary intake.

Diet ID vs.  
ASA24

- Participants took a mean of 3 minutes and 49 seconds (range 3:02 to 11:11; median 3:12) to complete the Diet ID.





*in partnership with*




**NUTRITIOUS EATING**

**WITH SOUL STUDY**

# **NEW Soul: Dissemination & Implementation – Nutrition Programming via Restaurants**

# **“We’re Not Meat Shamers. We’re Plant Pushers.”: How Owners of Local Vegan Soul Food Restaurants Promote Healthy Eating in the African American Community**

**Anthony Crimarco<sup>1</sup> ,**  
**Gabrielle M. Turner-McGrievy<sup>1</sup>,**  
**Marian Botchway<sup>1</sup>, Mark Macaуда<sup>1</sup>,**  
**Swann Arp Adams<sup>1</sup>, Christine E. Blake<sup>1</sup>,**  
**and Nicholas Younginer<sup>1</sup>**

Journal of Black Studies  
2020, Vol. 51 (2) 168–193

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# “We’re Not Meat Shamers. We’re Plant Pushers.”: How Owners of Local Vegan Soul Food

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vegan. The findings indicate there may be future opportunities for health educators to partner with these restaurant owners to improve healthy eating among AAs.

**Anthony Crimarco<sup>1</sup>** ,  
**Gabrielle M. Turner-McGrievy<sup>1</sup>,**  
**Marian Botchway<sup>1</sup>, Mark Macaуда<sup>1</sup>,**  
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**and Nicholas Younginer<sup>1</sup>**

# Grant trajectory



## 1. NHLBI R01 (2017-2022)

- Host: University of South Carolina
- Length: 2 years – Vegan and low-fat Omnivorous diet groups

## 2. NHLBI Diversity Supplement (2020-2022)

- Host: Rare Variety Café
- Length: 12-weeks – Vegan diet group only

## 3. NHLBI R01 (2022-2027)

- Host: SC and NC or GA restaurant
- Length: 12-weeks – Intervention and control



NUTRITIOUS EATING  
WITH SOUL STUDY

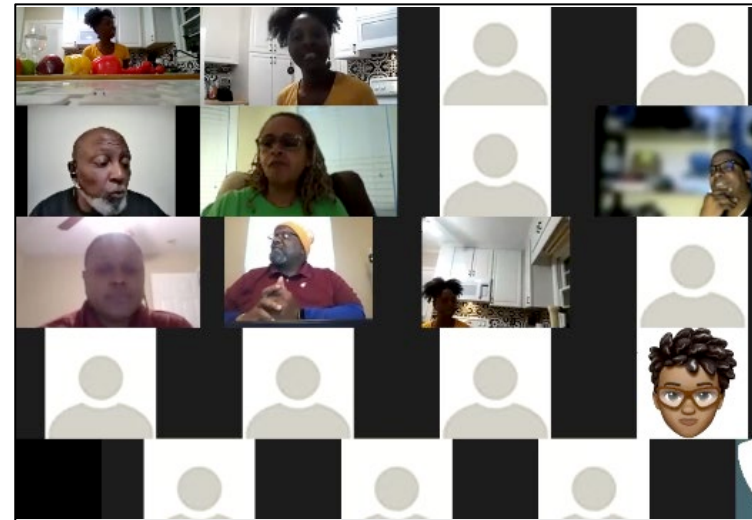

# NEW Soul @ RV



- Nutrition education, facilitated discussion, cooking demo

Plant-based diets and cholesterol

- You may have heard your doctor say you should cut back on consuming cholesterol to lower your own cholesterol.
- Only animal products (meat, fish, poultry, eggs, and dairy) contain cholesterol.
- There is no cholesterol in plants.
- A plant-based diet means a no-cholesterol diet...and that's good for your heart!





# NHLBI R01: NEW Soul D&I

**Aim 1: Evaluate effectiveness of 12-week program on body weight and diet quality among African Americans**

**Aim 2: Cost-effectiveness analysis intervention + voucher vs. voucher groups**

**Aim 3: Examine implementation of NEW Soul study --feasibility and utility**

# NHLBI R01: NEW Soul D&I

Partner with two restaurants to implement in-person  
12-week NEW Soul program

Restaurant #1: Celeb  
Studio with Chef J  
(Columbia, SC)

Restaurant #2: TBD in NC  
or GA

**CELEB STUDIO** @ Chef J



3 cohorts each  
N=38  
(19 intervention,  
19 control)



# Difference in data collection between NEW Soul and NEW Soul D&I

	<b>NEW Soul</b>	<b>NEW Soul D&amp;I</b>
<b>Initial surveys and diet collection location</b>	Academic research center computer lab with staff assistance	At home
<b>Height/weight, and blood pressure collection</b>	Academic research lab	At restaurant

# Switched to Diet ID for NEW Soul D&I

- No pushback from reviewers
- No complaints from participants



A person with curly hair, wearing a yellow knit sweater, is sitting at a wooden desk. They are looking at a smartphone in their hands. On the desk, there is a silver laptop, a grey coffee cup, and a small black device. The background is slightly blurred, showing a red container and some greenery. The overall lighting is warm and soft.

No one likes to track their  
diet

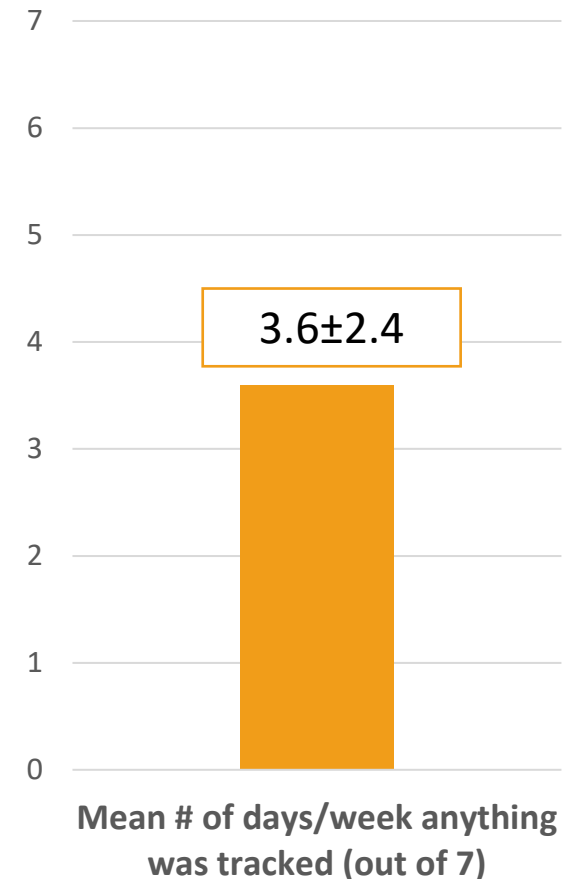
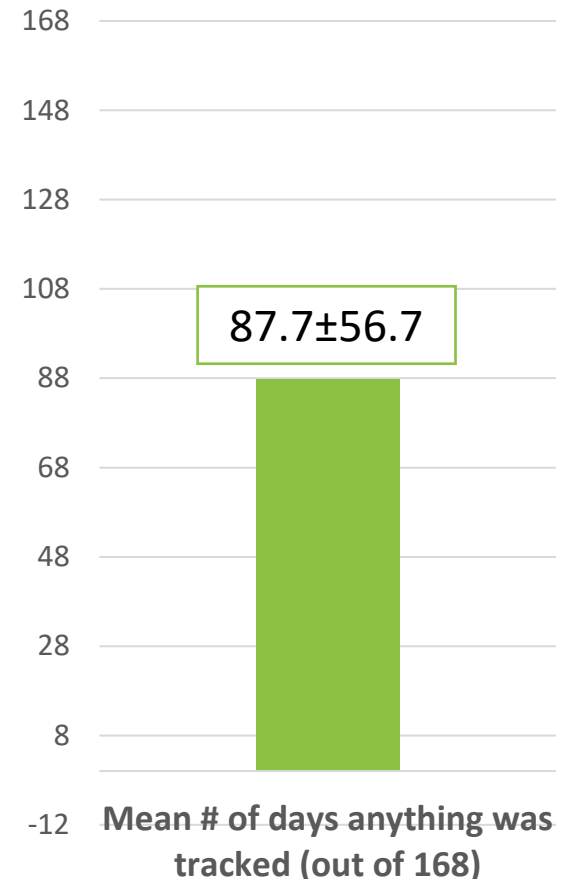
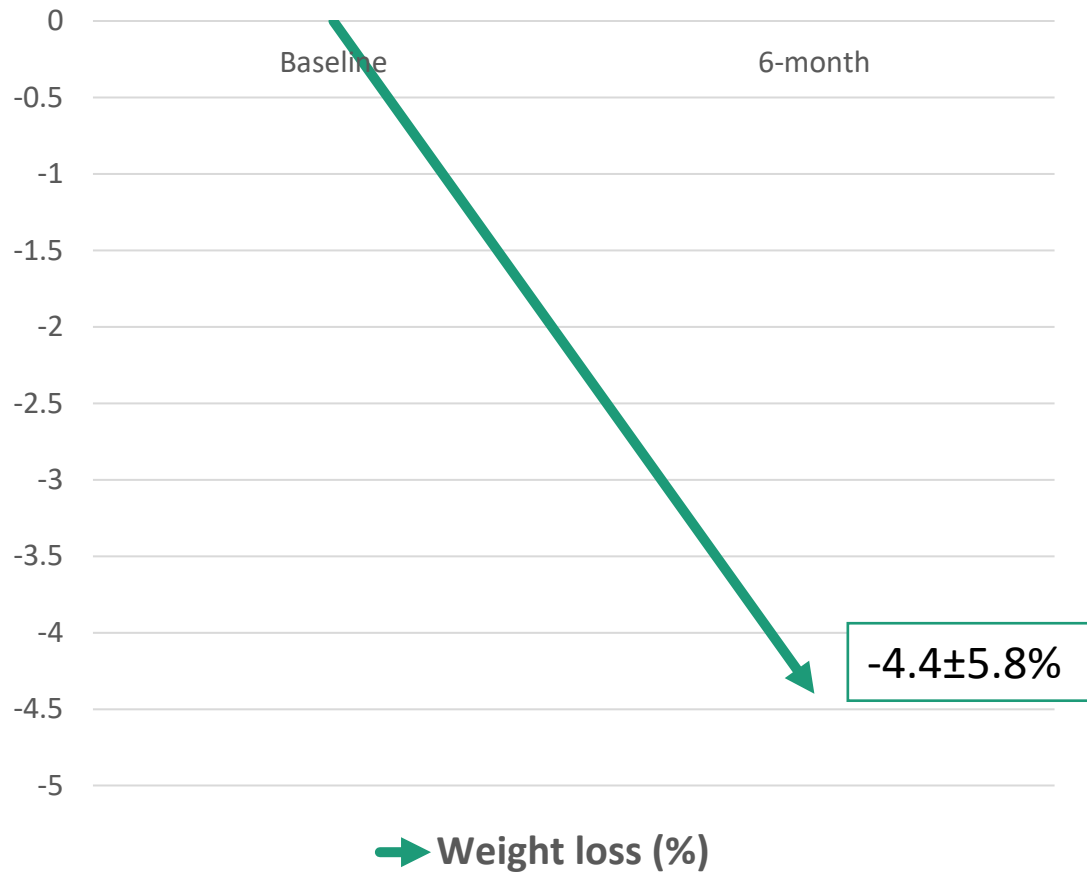


# Adherence to self-monitoring tends to decline over time

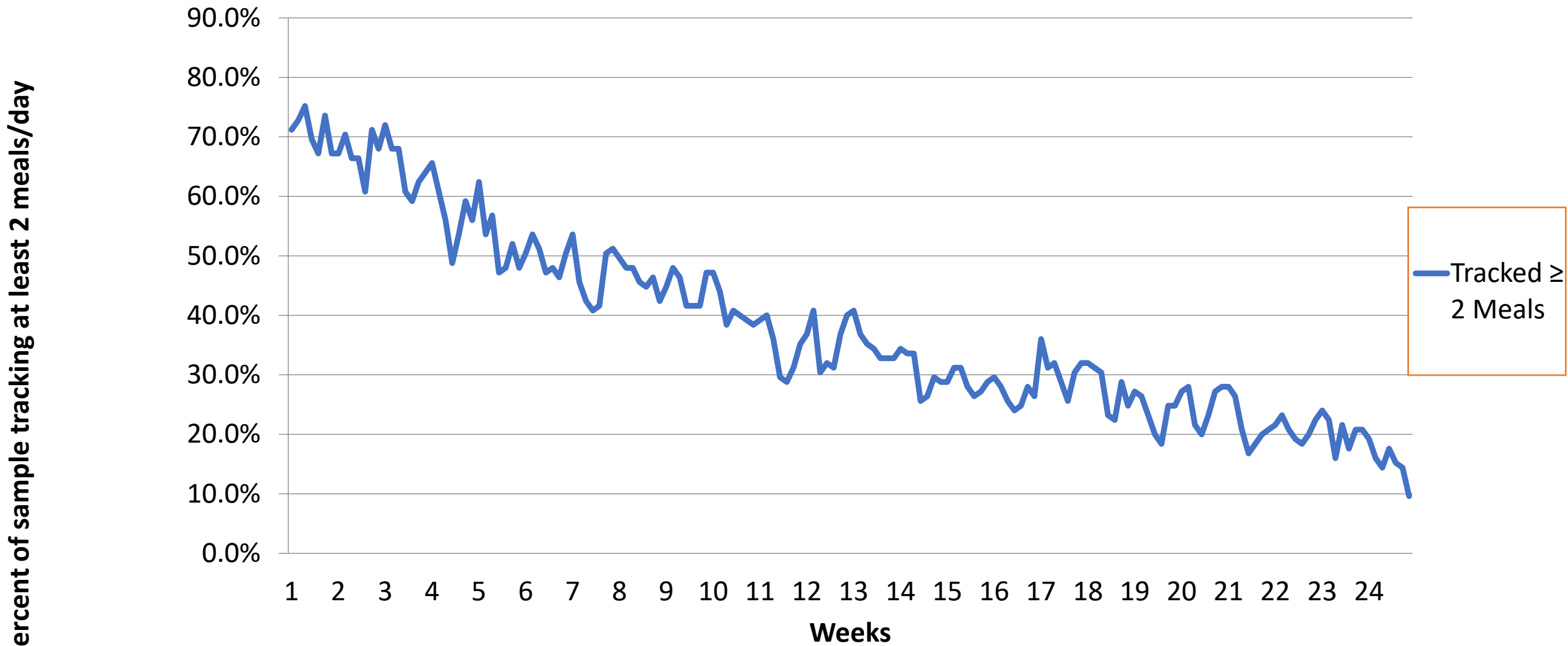
- We used objective mobile self-monitoring data from DIET Mobile and 2SMART studies that used three different types of self-monitoring methods (standard kcal app, wearable bite counter, and photo app):
  - Examined patterns of self-monitoring over time



# Mean % weight loss and overall self-monitoring of participants who completed the 2SMART and DIETm studies



# Percentage of participants meeting adherence criteria over 168 days using tracking at least two meals as the criterion (N=125 all study participants)



Your tool is only good if people use it





## Welcome to the BRIE lab

Our lab focuses on discovering ways to help people eat healthier, lose weight, and prevent chronic disease. To achieve this goal, the BRIE lab focuses on ways to use emerging technology to assist with dietary self-monitoring, physical activity tracking, and provision of social support. In addition, the BRIE lab also focuses on dietary approaches that do not require dietary self-monitoring, such as the vegan and vegetarian diets. Led by Dr. Brie Turner-McGrievy in the Arnold School of Public Health at the University of South Carolina, we've conducted a number of research

### FOLLOW ME ON TWITTER

Tweets by @briemcgriev



**Brie Turner-McGrievy**  
@briemcgriev

This totally made my day! @UofSC has some of the most incredible, bright, and motivated students I've ever had the pleasure to work with. I love seeing them go on to make the world a healthier place.

<https://twitter.com/USCResearch/status/14965>

# Thank you!

- Funding: R01HL163714, R01DK129302, R01DK128057, R01HL135220
- [www.BRIE.net](http://www.BRIE.net)



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Public Health**

# The Newest Vital Sign: Implementing Diet ID™ in the Research Setting

Rachel E. Scherr, PhD

Marcela D. Radtke, Doctoral Candidate

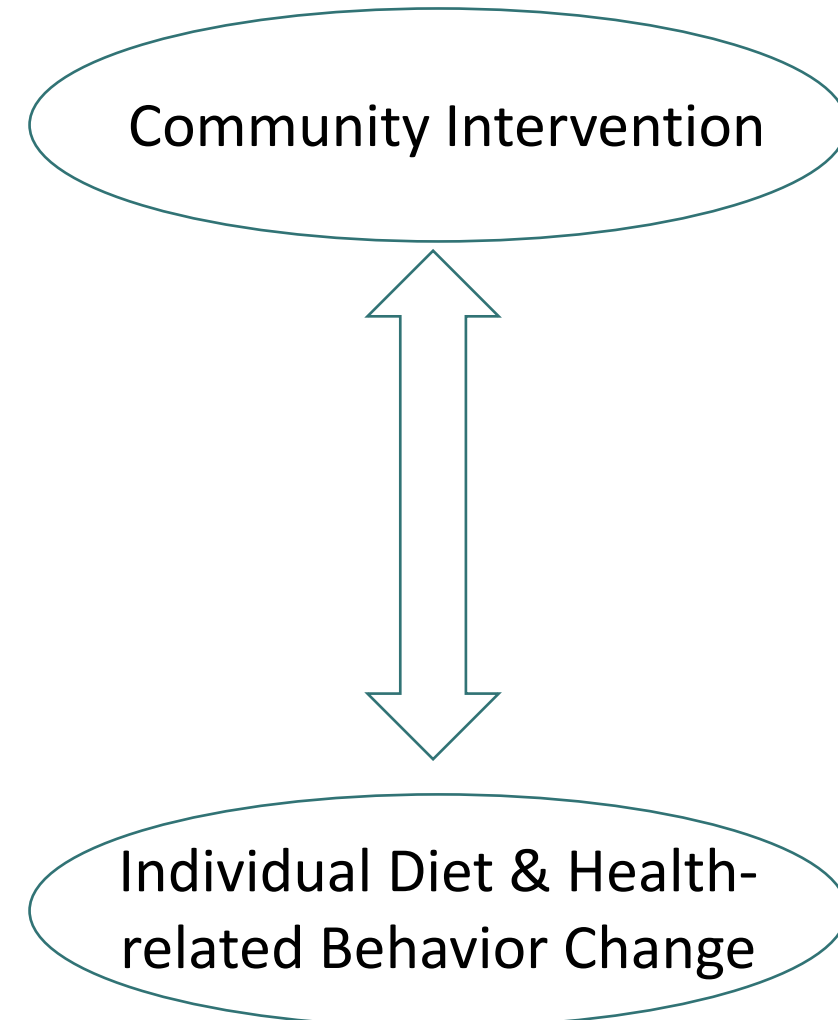
Food Truths Webinar Series

April 26, 2023



# Broad Research Themes

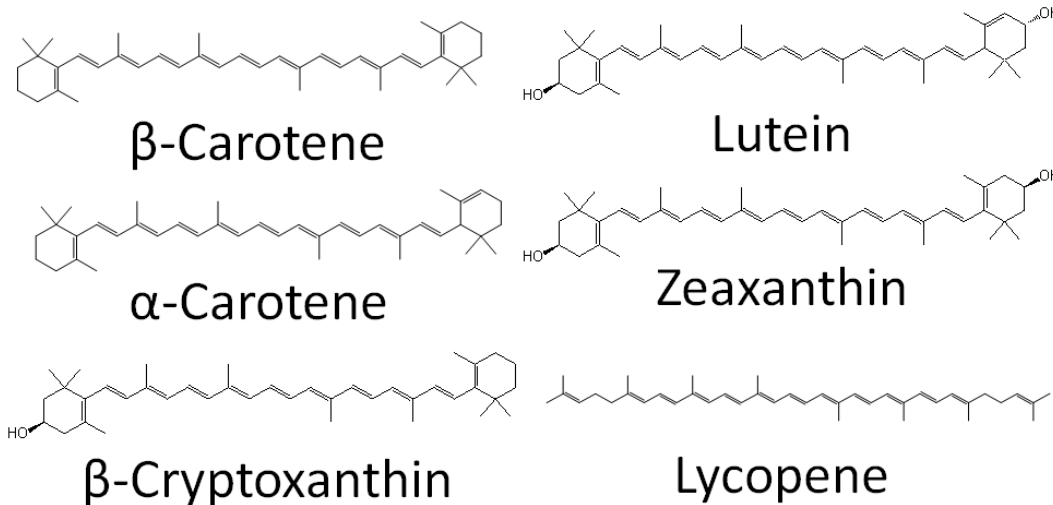
- Reciprocal relationship between community intervention and individual diet and health-related behavior change
- Challenges with collecting dietary intake data in a community-based setting warranted the need for a rapid, non-invasive assessment of dietary patterns and changes to dietary intake in a broad population
  - Children<sup>1</sup>
  - Adolescents<sup>2</sup>
  - Emerging Adults<sup>3</sup>
  - Low-income populations



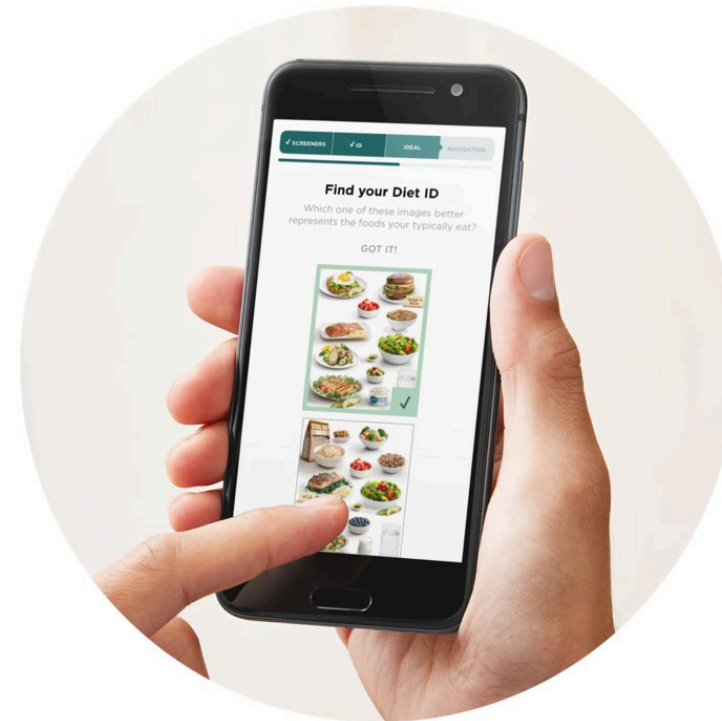


# Broad Research Themes

- To determine the impact of diet on other health-related risk factors, carotenoids were selected due to their antioxidant and anti-inflammatory properties, as well as their abundance in fruits and vegetables
- Diet ID <sup>TM</sup> output provided a rapid assessment of individual carotenoid intake, diet quality (HEI-score), and nutrients of concern for both over and under consumption



# Validation of Diet ID™ in Predicting Nutrient Intake Compared to 24-hour Dietary Recalls, Skin Carotenoid Scores, and Plasma Carotenoids in a Diverse Population of University Students



**Radtke MD**, Chodur GC, Bissell MCS, Kemp LC, Medici V, Steinberg FM, Scherr RE. Validation of Diet ID™ in Predicting Nutrient Intake Compared to Dietary Recalls, Skin Carotenoid Scores, and Plasma Carotenoids in University Students. *Nutrients* 2023;15(2):409. doi:10.3390/nu15020409

# Background

- Accurately assessing dietary intake in the research setting is challenging due to inherent biases and resource-intensive nature of traditional data collection methods<sup>4</sup>
- Emerging technology may assist in the dietary data collection process; however, such technology must be validated
- Previous validation studies compared Diet ID™ against dietary intake data from Food Frequency Questionnaires (FFQs)<sup>5</sup>, warranting additional validation against objective biomarkers of dietary intake

# Objective

- To validate Diet ID™ against biomarkers in the blood and skin, along with dietary intake and diet quality in a diverse population of university students



# Study Design

- Undergraduate and graduate student participants were recruited from the University of California, Davis
  - $n = 42$
- Participants attended two in-person clinic visits
  - Clinic Visit #1: Weeks 1-3
  - Clinic Visit #2: Weeks 8-10



Blood samples: plasma for carotenoid analysis using LC-MS



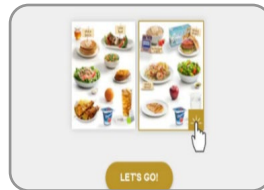
Skin carotenoid scores (SCS): Veggie Meter™



Anthropometrics: body mass index (BMI)



Dietary recalls and diet quality: Nutrition Data System for Research (NDSR) and Healthy Eating Index 2015 (HEI)



Dietary patterns: Diet ID™, an online toolkit for monitoring dietary behaviors and patterns

# Diet ID™ and NDSR

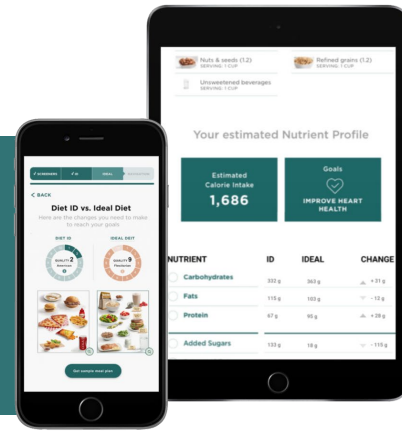
Nutrient	Correlation Coefficient	p-Value
HEI-2015 Score <sup>b</sup>	0.55	<b>&lt;0.001</b>
Calories (kcal) <sup>a</sup>	0.36	<b>0.02</b>
Protein (g) <sup>a</sup>	0.55	<b>0.0002</b>
Carbohydrates (g) <sup>a</sup>	0.31	<b>&lt;0.05</b>
Fat (g) <sup>a</sup>	0.29	NS (p = 0.06)
Cholesterol (mg) <sup>b</sup>	0.32	<b>0.003</b>
Vitamin A (mcg) <sup>a</sup>	0.39	<b>0.01</b>
Total Carotenoids (mcg) <sup>a</sup>	0.44	<b>0.003</b>
α-carotene (mcg) <sup>b</sup>	0.14	NS (p = 0.19)
β-carotene (mcg) <sup>b</sup>	0.39	<b>0.0003</b>
Lycopene (mcg) <sup>b</sup>	-0.09	NS (p = 0.40)
Lutein and Zeaxanthin (mcg) <sup>a</sup>	0.58	<b>0.0001</b>
Dietary Fiber (g) <sup>a</sup>	0.64	<b>&lt;0.0001</b>
Calcium (mg) <sup>a</sup>	0.36	<b>0.02</b>
Vitamin C (mg) <sup>a</sup>	0.44	<b>0.003</b>
Vitamin D (mcg) <sup>a</sup>	0.13	NS (p = 0.41)
Vitamin E (mg) <sup>a</sup>	0.35	<b>0.02</b>
Sodium (mg) <sup>a</sup>	0.36	<b>0.02</b>
Potassium (mg) <sup>a</sup>	0.58	<b>0.0001</b>
Folate (mcg) <sup>a</sup>	0.37	<b>0.02</b>
Iron (mg) <sup>a</sup>	0.31	<b>0.04</b>
Vitamin B <sub>1</sub> (Thiamin) (mg) <sup>a</sup>	0.13	NS (p = 0.40)
Vitamin B <sub>2</sub> (Riboflavin) (mg) <sup>a</sup>	0.34	<b>0.03</b>
Vitamin B <sub>3</sub> (Niacin) (mg) <sup>a</sup>	0.42	<b>0.005</b>
Vitamin B <sub>6</sub> (Pyridoxine) (mg) <sup>a</sup>	0.57	<b>0.0001</b>
Vitamin B <sub>12</sub> (Cobalamin) (mcg) <sup>b</sup>	0.18	NS (p = 0.09)



<sup>a</sup> Calculated using Pearson's correlation coefficient ( $\rho$ ).

<sup>b</sup> Calculated using Kendall's tau ( $\tau$ ).

# Diet ID™, Skin Carotenoid Scores, and Plasma Carotenoids



Variables	Linear Regression (Adjusted R <sup>2</sup> )	P-value
SCS and Total Carotenoids from Diet ID™; controlling for BMI	0.41	< 0.0001
Plasma Carotenoids and Total Carotenoids from Diet ID™; controlling for BMI	0.37	0.0001
SCS and Total Plasma Carotenoids; Controlling for BMI	0.68	< 0.0001



ID your current diet.

Choose your IDEAL diet.

**TRACK** your diet progress.



**LET'S GO!**

Already have a profile? Log in.

# Conclusions

- Diet ID™ was significantly correlated to NDSR output for almost all nutrients evaluated, as well as SCS and plasma carotenoids
- Diet ID™ is a low-cost and minimally burdensome data collection method that may be implemented in nutrition research



# Diet Quality and Diet-related Biomarkers Improve with Use of On-Campus Food Access Resources



Radtke MD, Chodur GC, Kemp LC, Medici V, Steinberg FM, Scherr RE. Diet Quality and Diet-related Biomarkers Improve with Use of On-Campus Food Access Resources. Submitted to the *American Journal of Clinical Nutrition*.

# Background

- College students are an inherently vulnerable subpopulation of emerging adults who are at an increased risk for food insecurity<sup>6</sup>
- Many universities in the United States have responded to the high rates of food insecurity in the college student population with creating on-campus food access resources<sup>7</sup>
- To date, the efficacy of on-campus food access resources relies on qualitative, anecdotal feedback or self-reported health outcomes



- To determine whether students utilizing food access resources have improvements in biomarkers for health and higher fruit and vegetable consumption compared to students not utilizing on-campus food access resources

Objective



# Study Design

- Participants ( $n = 132$ ) attended two in-person clinic visits (8 weeks apart)
  - Blood samples
  - Skin carotenoid scores
  - Anthropometrics (height, weight, blood pressure)
  - Nutrition knowledge questionnaire
  - Diet ID™
- Use of on-campus food access resources was collected weekly and categorized into quartiles



Does not use

1 – 2 visits  
per term

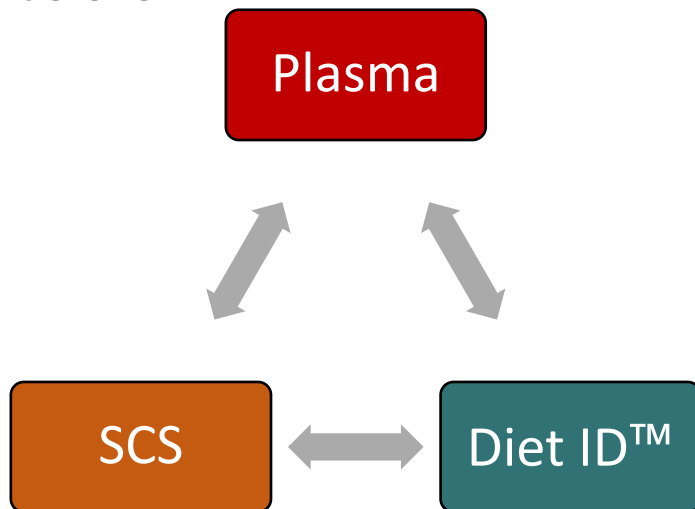
3 – 5 visits  
per term

6 – 8 visits  
per term



# Results

- Associations between plasma, skin, and dietary carotenoids were assessed to determine criterion-validity of measurement tools



	Correlation Coefficient	P-value
Plasma carotenoids and SCS	$P = 0.84$	$p < 0.0001$
Plasma carotenoids and Diet ID™ carotenoids	$\tau = 0.19$	$p = 0.002$
Plasma $\alpha$ -carotene and Diet ID™ $\alpha$ -carotene	$\tau = 0.18$	$p = 0.002$
Plasma $\beta$ -carotene and Diet ID™ $\beta$ -carotene	$\tau = 0.14$	$p = 0.02$
Plasma carotenoids and Diet ID™ HEI-2015 score	$\tau = 0.26$	$p < 0.001$
Linear Regression Outcomes		
	Adjusted R <sup>2</sup>	P-value
Plasma carotenoids and SCS; controlling for BMI	0.72	$p < 0.001$
Diet ID™ carotenoids and SCS; controlling for BMI	0.18	$p < 0.001$
Diet ID™ $\beta$ -carotene and SCS; controlling for BMI	0.18	$p < 0.01$

# Results

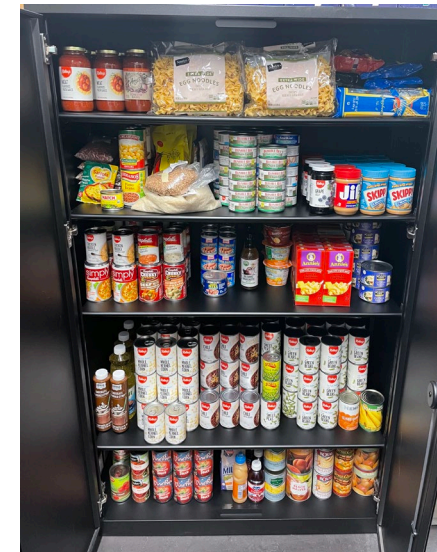
- When controlling for the use of food access resources, significant improvements in plasma carotenoids, skin carotenoids, and dietary intake were observed

	Adjusted R <sup>2</sup> *	<i>p</i> -value
Plasma Carotenoids	0.50	<b>p &lt; 0.0001</b>
Skin Carotenoids	0.83	<b>p &lt; 0.0001</b>
Diet ID Carotenoids	0.30	<b>p &lt; 0.0001</b>

\* Models were adjusted for the numbers of times food access resources were used, food security status, and body mass index.

# Conclusions

- The use of on-campus food access resources improved biomarkers associated with dietary intake of fruit and vegetables, as well diet quality over the academic term
- These findings support the development and expansion of food access resources to mitigate the negative health outcomes associated with food insecurity





# Exploring the Interrelationship Between Executive Function and Food Security Status

Radtke MD, Chodur GC, Kemp LC, Steinberg FM, Scherr RE. Exploring the Interrelationship Between Executive Function, Food Security Status, and Stress. To be submitted to *Nutritional Neuroscience* in May 2023.



# Background

- Food security status and the relationship to diet quality and stress may be impacted by decision-making, impulsivity, multi-tasking, acute and long-term planning capabilities<sup>8</sup>
- Executive function (EF) may play a crucial role in mediating the relationship between food insecurity and indicators of academic achievement and physical and emotional well-being<sup>9</sup>

# Objectives

- To investigate if food security status is associated with differences in executive function using the objective CANTAB assessment tool
- To assess if food security status mediates the relationship between executive function and diet quality using Diet ID™ and the Healthy Eating Index (HEI-2015)



# Study Design

- In collaboration with Diet ID™ and National Food Access and Covid Research Team (NFACT)
- Participants ( $n = 350$ ) completed the following assessments:
  - CANTAB Assessment
  - Perceived Stress Scale (PSS)
  - Adverse Childhood Experiences (ACE) Survey
  - Self-reported Anthropometrics
  - USDA 10-item Adult Food Security Survey Module
  - Demographic Information/COVID Survey
  - Diet Quality measured using Diet ID™
- Manuscript forthcoming in May 2023

# Advantages using Diet ID™ for Research

- The validation of Diet ID™ against objective biomarkers in the blood and skin, as well as 24-hour NDSR dietary recalls increases the availability and accessibility of dietary assessment in the clinical and community settings
  - Low-income populations
  - Non-native English speakers
  - Toddlers and children
- Researcher challenges
  - Time
  - Cost

# Thank you for your time!

