



# Million Veteran Program nutrition data release

**J Michael Gaziano** (M.D., M.P.H.)

*Massachusetts Veterans Epidemiology Research and Information Center (MAVERIC),  
VA Boston Healthcare System*

*Division of Aging, Brigham and Women's Hospital, Harvard Medical School*

**Luc Djoussé** (M.D., Sc.D., M.P.H.)

*Massachusetts Veterans Epidemiology Research and Information Center (MAVERIC),  
VA Boston Healthcare System*

*Division of Aging, Brigham and Women's Hospital, Harvard Medical School  
Department of Nutrition, Harvard T H Chan School of Public Health*

**VA**



U.S. Department  
of Veterans Affairs

DISCOVERY ★ INNOVATION ★ ADVANCEMENT

WHY WE DO  
WHAT WE DO

# Dietary research from the MVP has captured Veteran's imaginations



Kerry Ivey

Dietary changes are something that Veterans can do straight away to directly improve their health.

VA | News

Home / Health / Yogurt is good for your heart, VA study finds

## Yogurt is good for your heart, VA study finds



pngtree.com

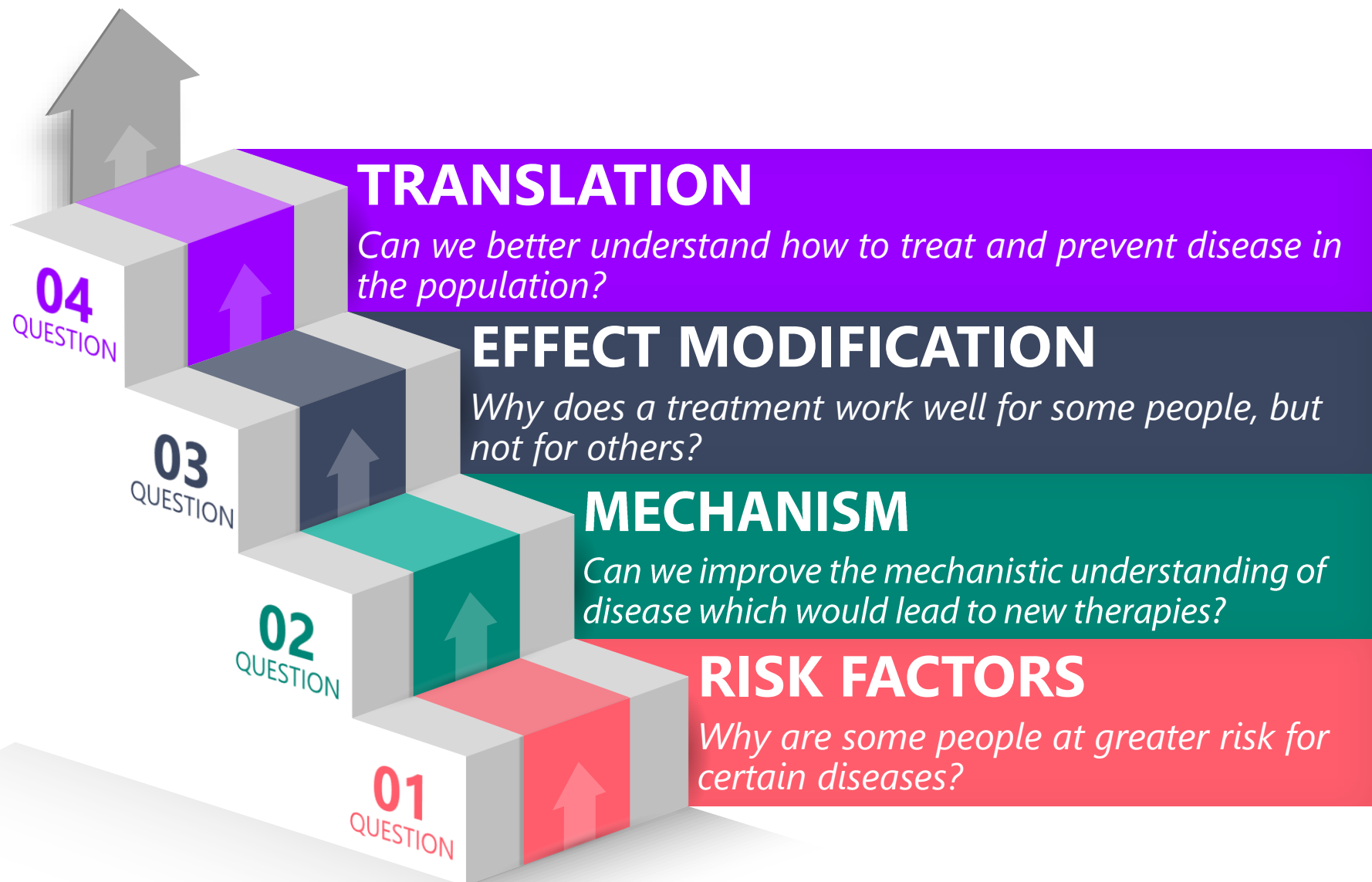
Our research suggests that the simple act of eating more yogurt may improve the heart health of Veterans

**Nutrition is deeply involved in all types of mechanisms that constitute life.**

By shedding light on the diet-disease relationship, nutritional epidemiology helps us to understand the enormous complexity of life a little bit better.

**CENTRAL  
QUESTIONS**

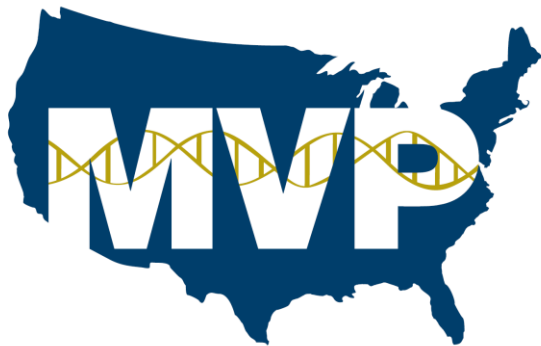
# Questions that need to be answered in order to improve Veteran health and wellbeing



## ADDRESSING THE CENTRAL QUESTIONS

# The data within the Million Veteran Program is the key to addressing the central questions

Since 2011, we have enrolled over **900,000** US Veterans into one of the world's largest programs on diet, genetics, and health.



## MILLION VETERAN PROGRAM



## KEY PERSONNEL

# MVP is built upon a foundation of multidisciplinary, collaborative teams

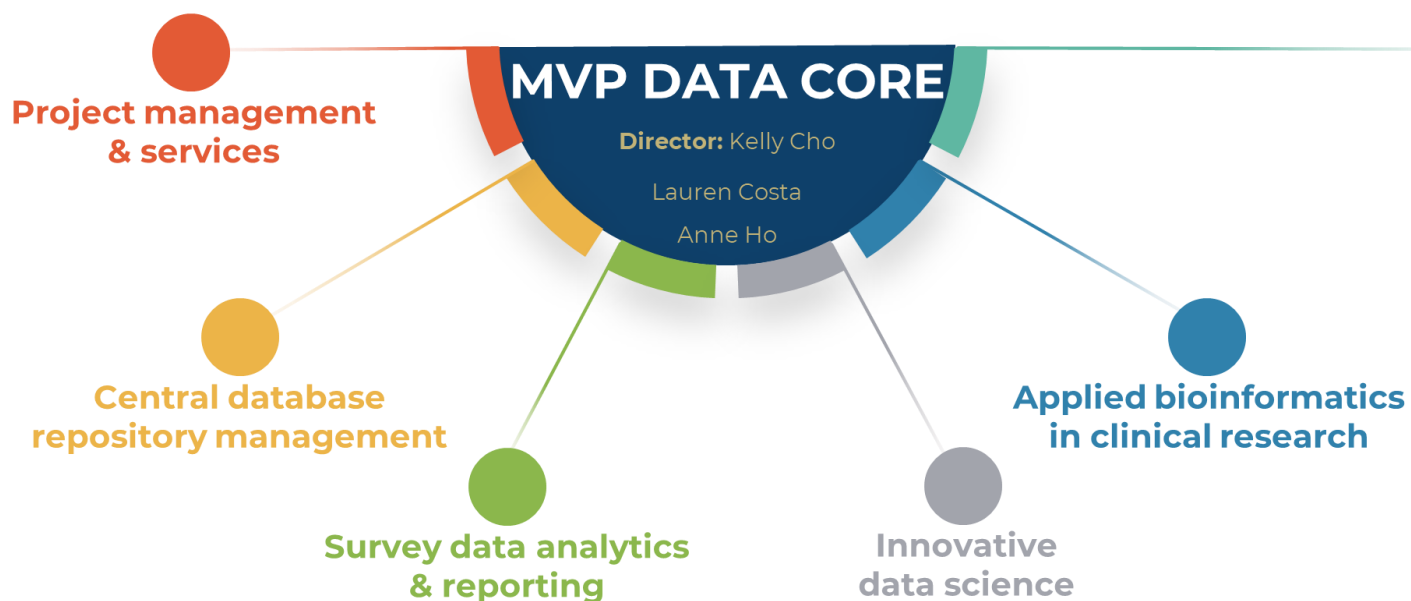
**MVP Program Director:** Sumitra Muralidhar

**MVP PIs:** J. Michael Gaziano & Philip Tsao

**MVP Executive Leadership Lead:** JP Casas

### Domain Leads

- Cohort Management : Stacey Whitbourne
- Data Core : Kelly Cho
- Genomics: Saiju Pyarajan
- Recruitment Informatics : Alex Shahpoor
- Regulatory Affairs : Lori Churby
- Biorepository: Luis Selva



## Nutrition core



Luc Djoussé



Mai Nguyen



Kerry Ivey



Yanping Li



Daniel Wang

## AGENDA

# The future potential arising from our strategic assessment of diet in the MVP

**MVP's valid dietary assessment...**

**at all levels of hierarchy and granularity...**

**combined with risk factor assessments...**

**and the world's largest genetic collection...**

**provides a detailed picture of health...**

**to address the central questions.**

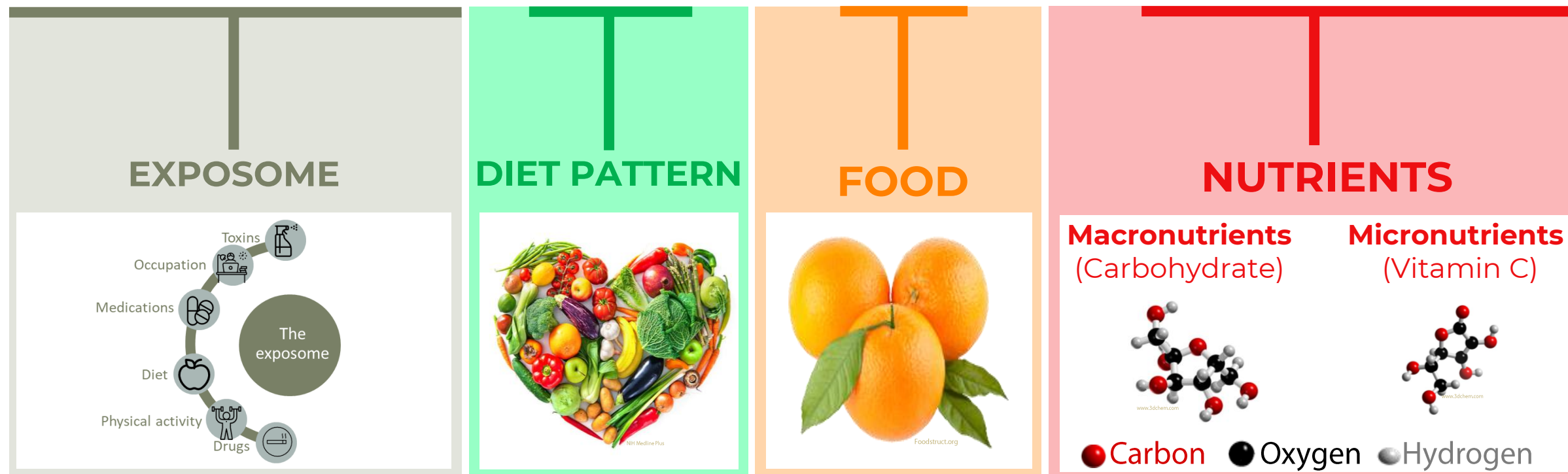


# 1. MVP's VALID DIETARY ASSESSMENT

# Nutrients: Substances that provide nourishment essential for growth and maintaining life.

Oxford Languages

A Veteran who enjoys running, is a vegetarian who eats oranges containing carbohydrates and Vitamin C



**Our question is... How does the exposome, dietary pattern, and food/nutrient consumption of Veterans shape their health and disease status?**

To answer this question, we want to know if one Veteran eats more/less than another Veteran.



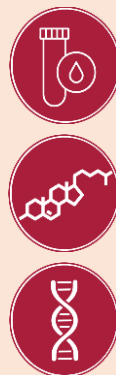
# 1. MVP's VALID DIETARY ASSESSMENT

# Strategic timing of dietary assessments in the MVP

## Electronic Health Records (~40 years)



## Biological samples



## Lifestyle and health questionnaires



## 1. MVP's VALID DIETARY ASSESSMENT

# Dietary assessment is the first step in investigating diet-health associations

It is critical that the tool used to assess diet yields **valid** estimates of intake over the specific time periods of interest.



**1 day:** Recall what you previously ate

- *E.g., 24-hour recall*

**1 week:** Weigh/record everything you eat

- *E.g., 7-day weighed record*

**1 year:** Answer questions about your typical diet

- *E.g., semiquantitative food frequency questionnaire*

## 1. MVP's VALID DIETARY ASSESSMENT

# Diet assessment and valid semiquantitative food frequency questionnaire used in the MVP

### • How often, on average, have you used the amount specified during the past year?

- 8 dairy foods
- 6 fruits
- 14 vegetables
- 14 meats, nuts and oils
- 6 baked goods and sweets
- 4 cereal foods
- 8 beverages

### • How do you prepare your meals?

- 16 questions

### • Do you follow a special diet?

- 11 questions

### • Have you changed your diet?

- 12 questions



# 1. MVP's VALID DIETARY ASSESSMENT

## Step 1 in assessing diet: Veterans manually completed the food frequency questionnaire

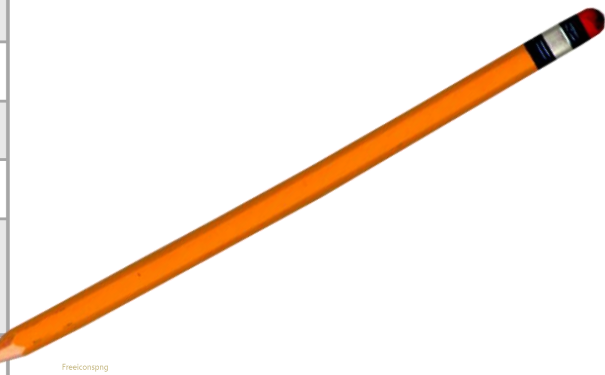
### Section I: Dietary Habits

57. For each food listed, please mark the column indicating how often, on average, you have used the amount specified during the **PAST YEAR**.

Serving size shown in parenthesis ( )	Average Use Last Year								
	Never or less than once a month	1 – 3 per month	Once (1) a week	2 – 4 per week	5 – 6 per week	Once (1) a day	2 – 3 per day	4 – 5 per day	6+ per day
<b>DAIRY FOODS</b>									
Skim or low fat milk (8 oz. glass)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Whole milk (8 oz. glass)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yogurt (1 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice Cream (1/2 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cottage or Ricotta cheese (1/2 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other cheese, e.g., American, cheddar, etc., plain or as part of a dish (1 slice or 1 oz. serving)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Margarine (pat), added to food or bread; exclude use in cooking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Butter (pat), added to food or bread; exclude use in cooking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

a. What type of butter do you usually use?

- Stick                       Tub                       Extra light                       None  
 'Lite' stick                       'Lite' tub                       Squeeze



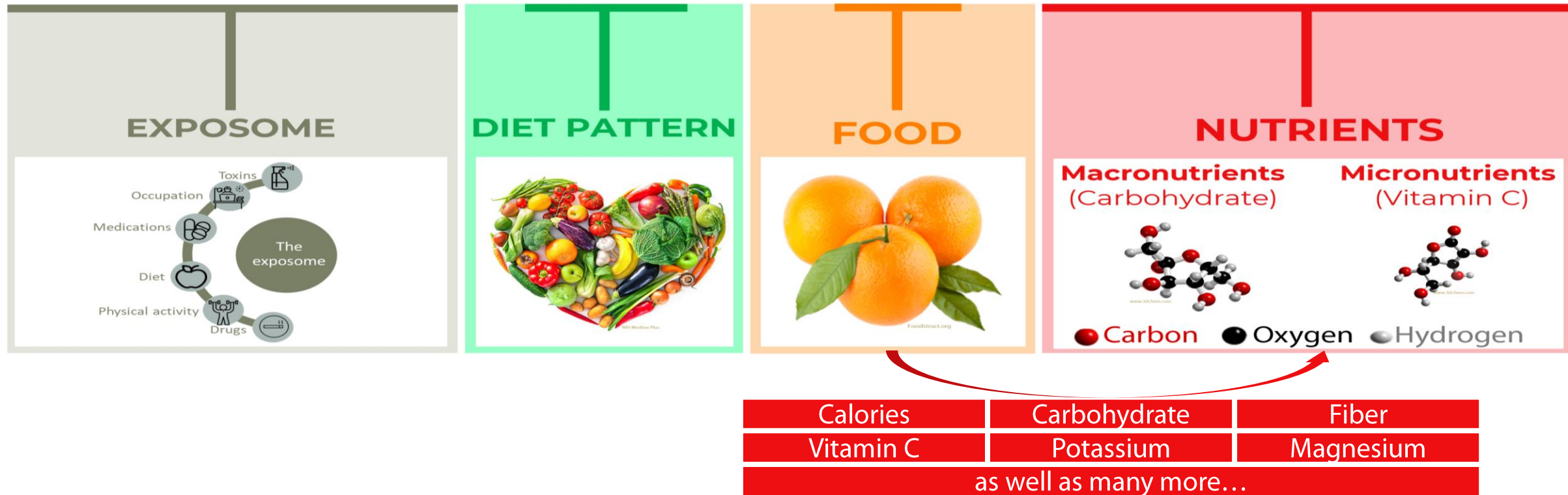
# 1. MVP's VALID DIETARY ASSESSMENT

# Food composition tables help us transform food intake responses to nutrient intake estimates

If a Veteran eats 1 orange per day, how much vitamin C do they typically eat?

Answering this question is a non-trivial, complicated and fluid process that involves food composition databases and nutrition experts

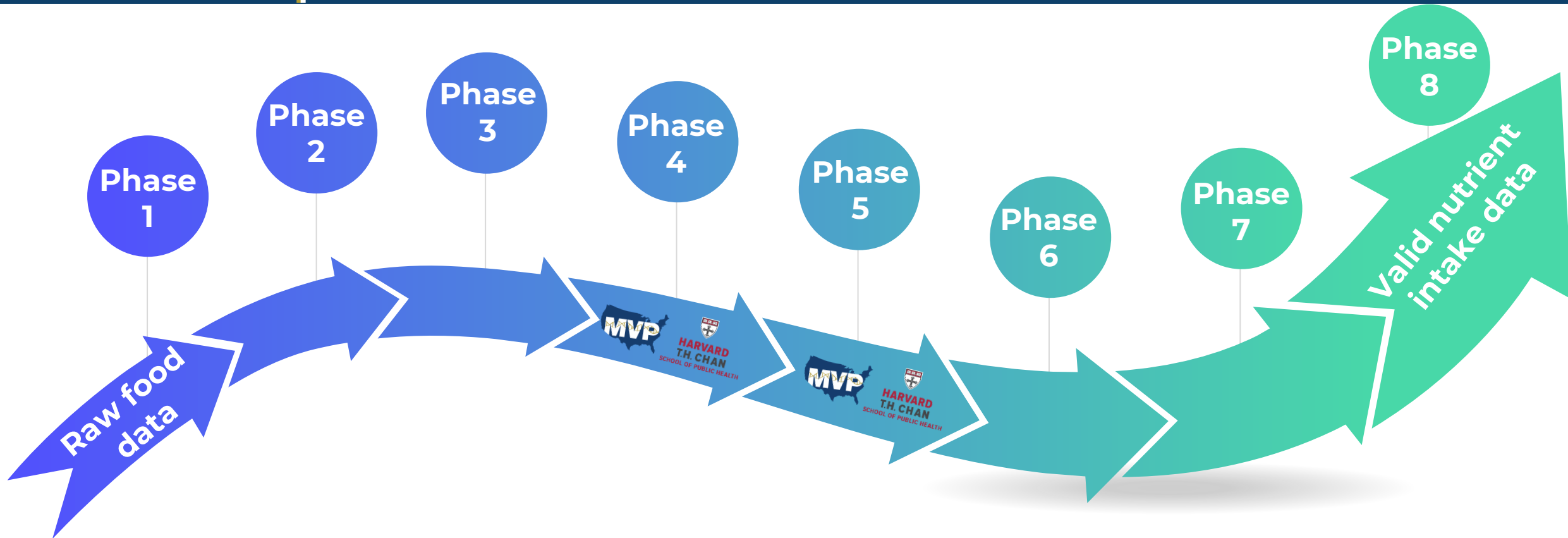
A Veteran who enjoys running, is a vegetarian who eats oranges containing carbohydrates and Vitamin C



The **Harvard Food Composition Database** tells us how much of each nutrient is in the average food. It is updated regularly and supplemented by both manufacturers and laboratories

# 1. MVP's VALID DIETARY ASSESSMENT

# The intricate journey from manual questionnaire completion to estimates of nutrient intake



**Questionnaire**

Section I: Dietary Habits

57. For each food listed, please mark the column indicating how often, on average, you have used the amount specified during the **PAST YEAR**.

Serving size shown in parentheses ( )	Average Use Last Year								
	Never or less than once a month	1-3 per month	Once (1) a week	2-4 per week	5-6 per week	Once (1) a day	2-3 per day	4-5 per day	6+ per day
<b>DAIRY FOODS</b>									
Skim or low fat milk (8 oz. glass)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Whole milk (8 oz. glass)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yogurt (1 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice Cream (1/2 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cottage or Ricotta cheese (1/2 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Process**

Apply exclusions to low quality data

**Scan & QC**

Code and double check internally

**Compute**

Estimate daily nutrient intake at the Harvard TH Chan School of Public Health

**External QC**

Completed at the Harvard TH Chan School of Public Health

**Internal QC**

Completed by the MVP Nutrition Core

**Exclude**

Apply exclusions to low quality data

**Validate**

Complete validation studies

Mai Nguyen

Dietary data on **352,857** Veterans is now available to MVP investigators

Frequency of  
**61**  
food items

Information on  
**322**  
nutrients

Energy  
information

Frequency of  
**21**  
supplements

## AGENDA

# The future potential arising from our strategic assessment of diet in the MVP

MVP's valid dietary assessment...

**at all levels of hierarchy and granularity...**

combined with risk factor assessments...

and the world's largest genetic collection...

provides a detailed picture of health...

to address the central questions.





# WE VALIDATED ALL LEVELS OF VIEWING DIET

# Diet: The kinds of food that a person or community habitually eats

Oxford Languages

LEVEL

01

NUTRIENTS

LEVEL

02

NUTRIENT GROUPS

LEVEL

03

FOODS

LEVEL

04

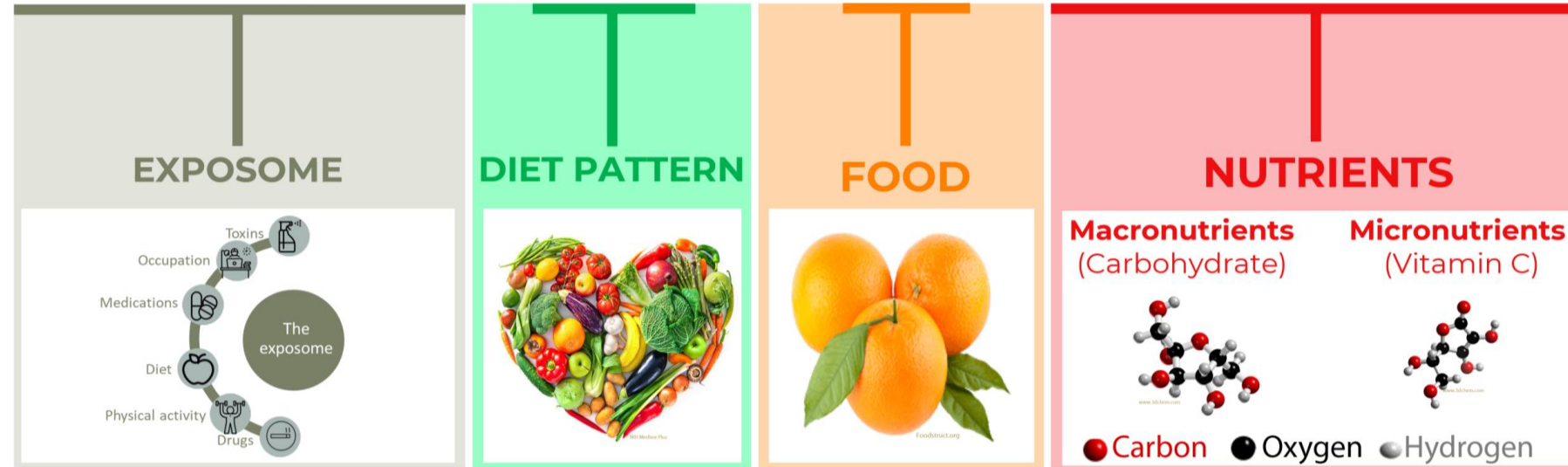
FOOD GROUPS AND PATTERNS

LEVEL

05

EXPOSOME

A Veteran who enjoys running, is a vegetarian who eats oranges containing carbohydrates and Vitamin C



Our question is... How does the exposome, dietary pattern, and food/nutrient consumption of Veterans shape their health and disease status?

**WE VALIDATED ALL LEVELS OF VIEWING DIET**

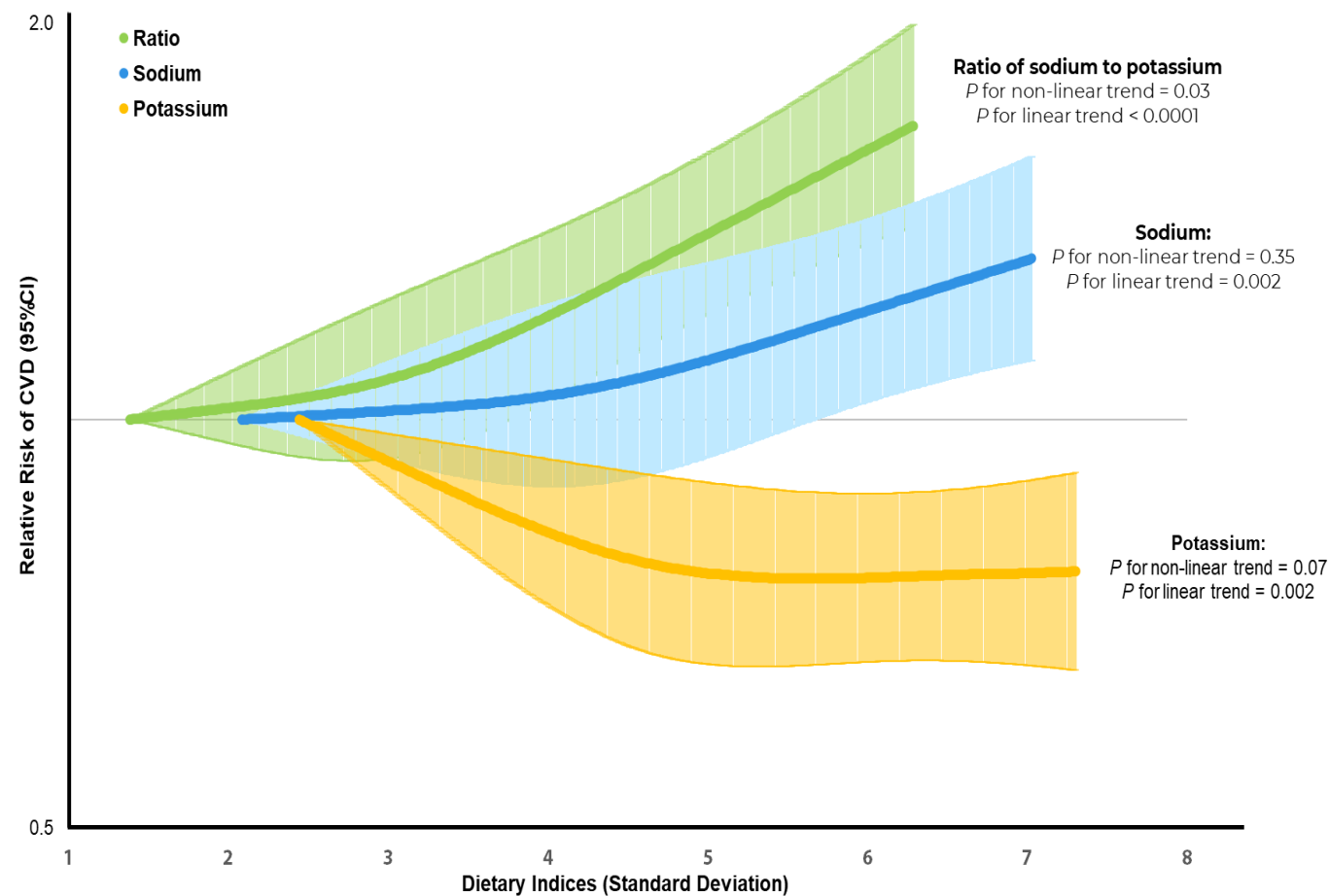
# Sodium/potassium validation study



Daniel Wang



A high sodium intake was associated with a higher risk of CVD  
 A high potassium intake was associated with a lower risk of CVD

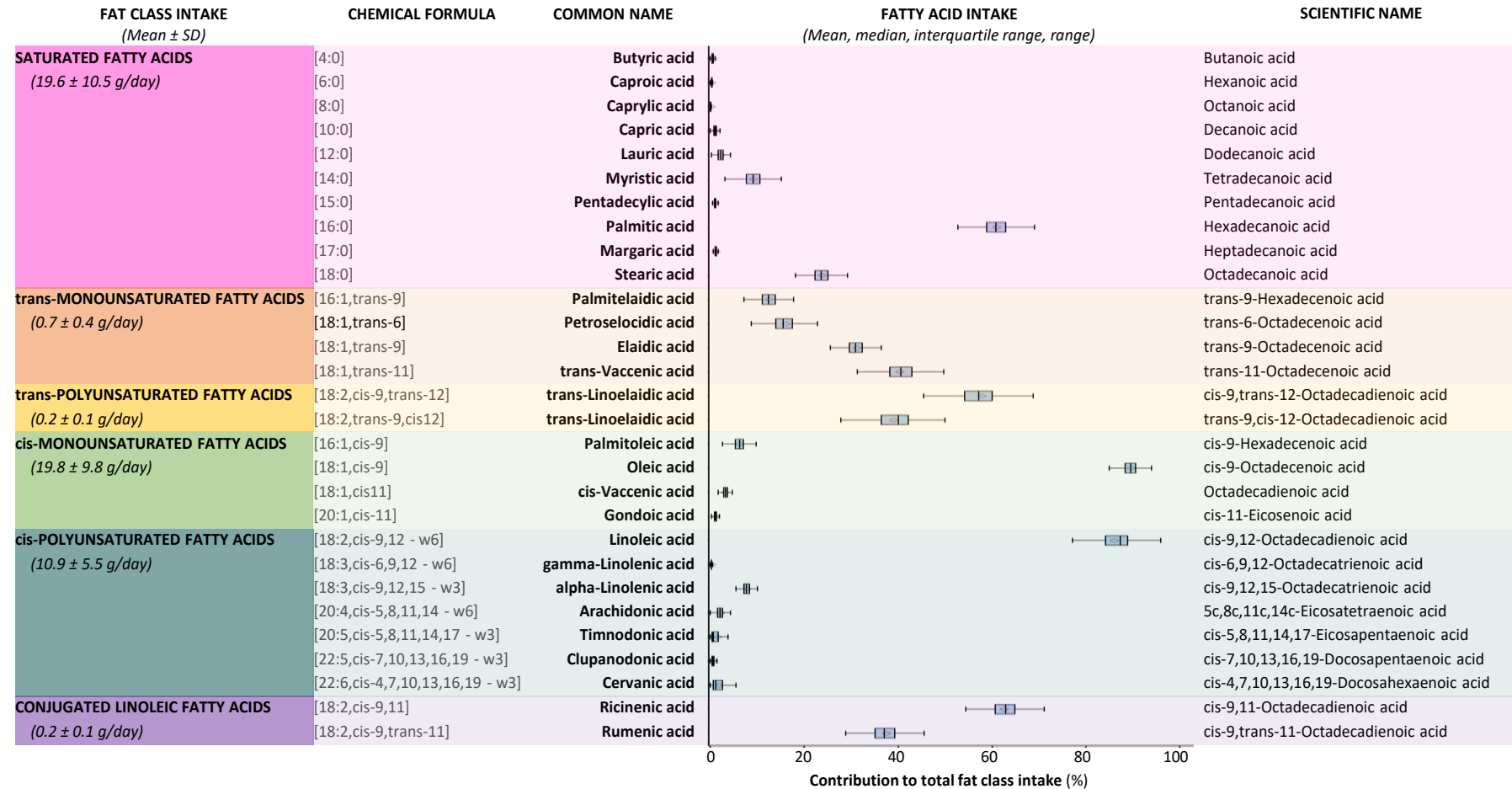
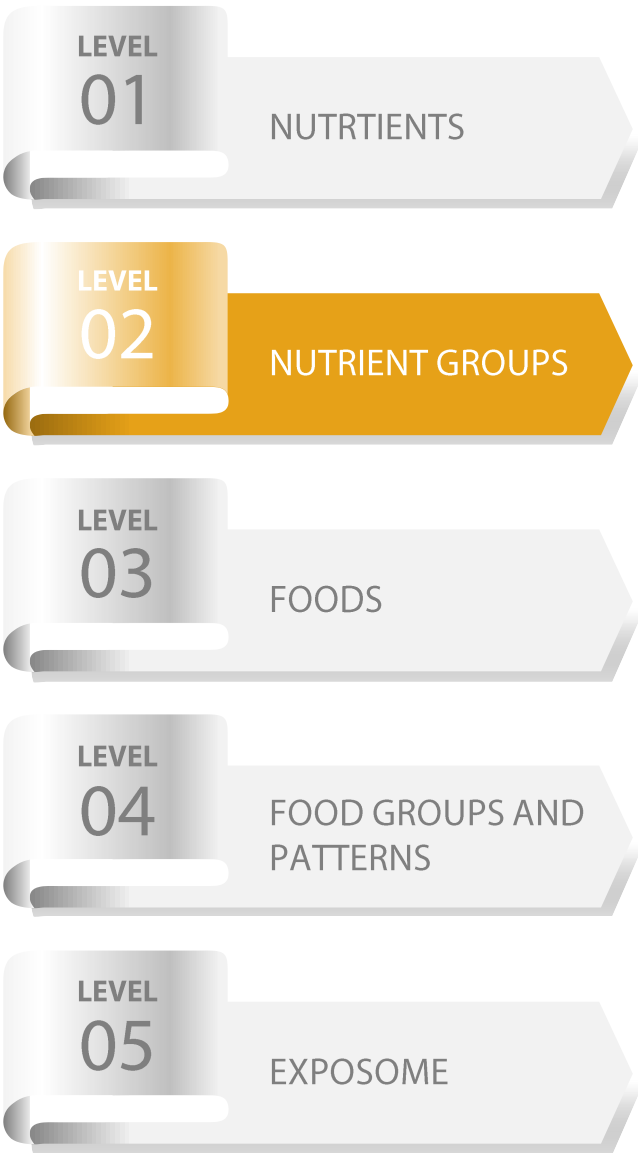


**WE VALIDATED THE FFQ AT ALL LEVELS**

# Fat validation study



Kerry Ivey



**WE VALIDATED  
THE FFQ AT ALL  
LEVELS**

# Nut validation study



Kerry Ivey

LEVEL

01

NUTRIENTS

LEVEL

02

NUTRIENT GROUPS

LEVEL

03

FOODS

LEVEL

04

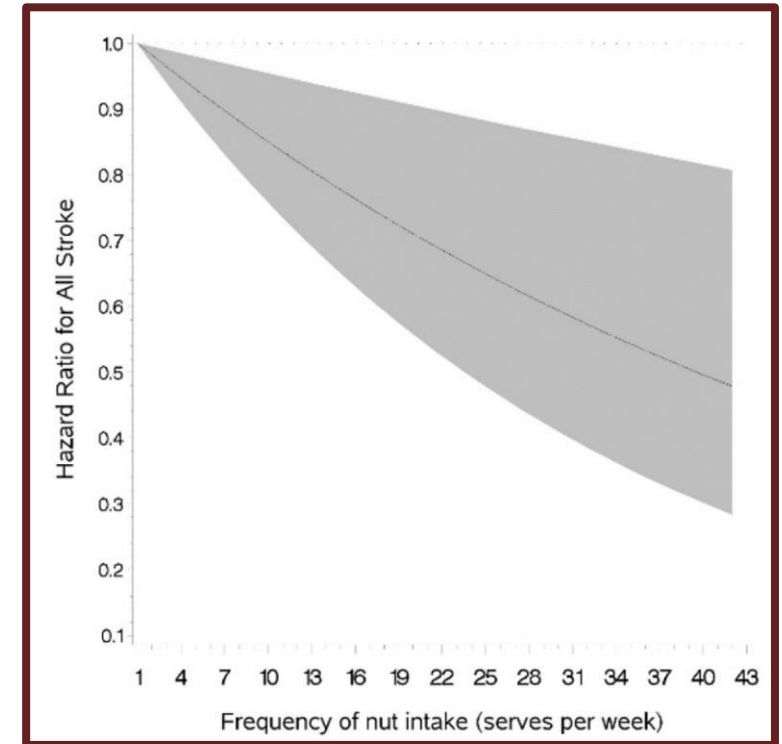
FOOD GROUPS AND  
PATTERNS

LEVEL

05

EXPOSOME

Veterans who ate more nuts were at lower risk of experiencing a stroke

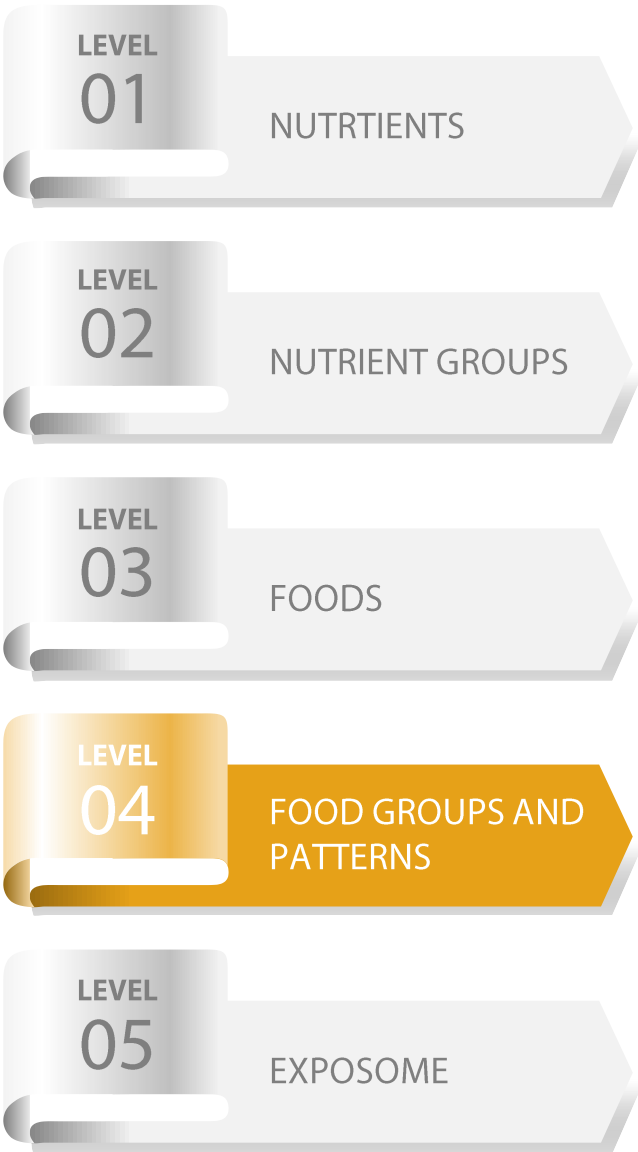


**WE VALIDATED THE FFQ AT ALL LEVELS**

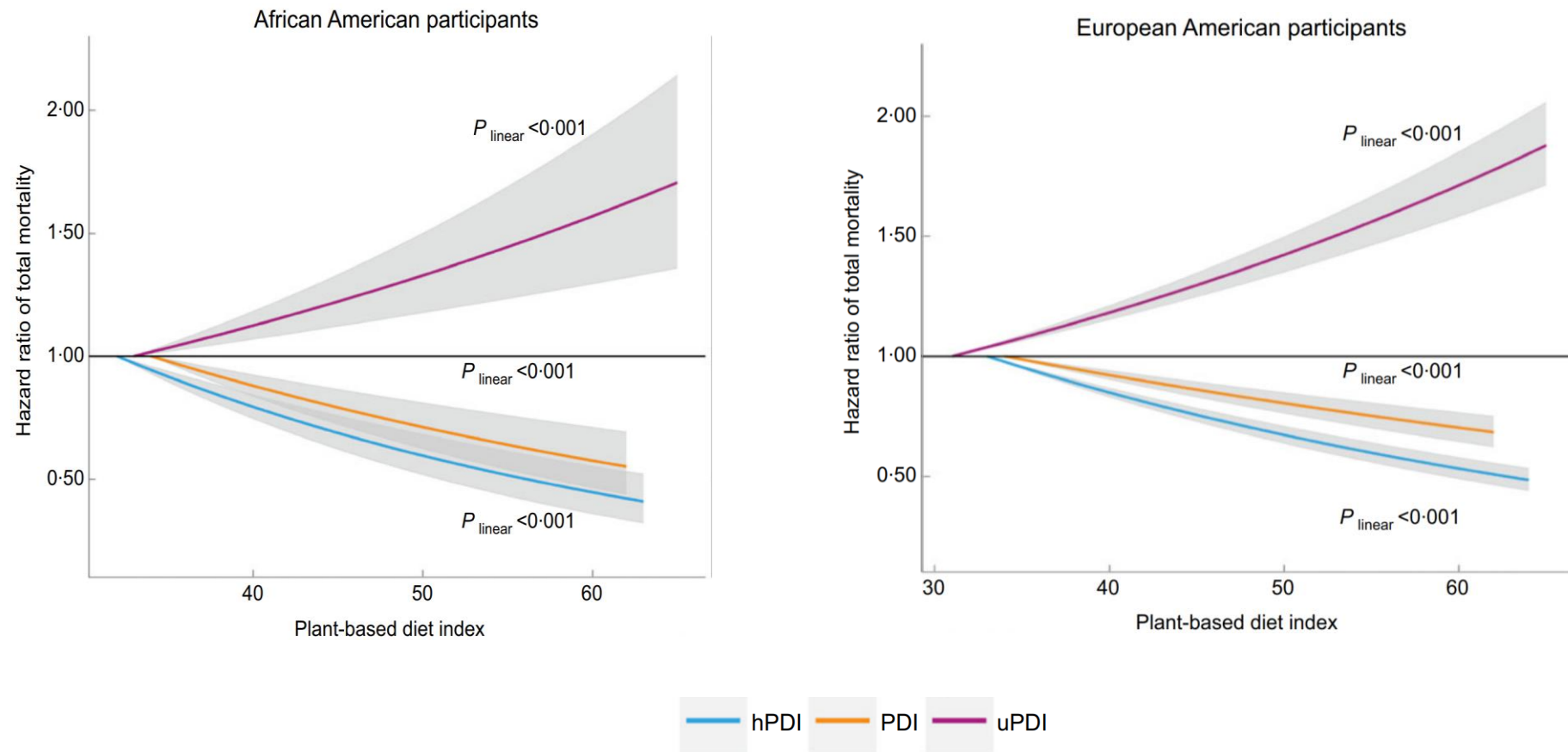
# Plant-based foods validation study



Yanping Li



Veterans who ate more plant-based foods were at lower risk of mortality



**WE VALIDATED  
THE FFQ AT ALL  
LEVELS**

# Exposome validation study



Kerry Ivey

LEVEL  
01  
NUTRIENTS

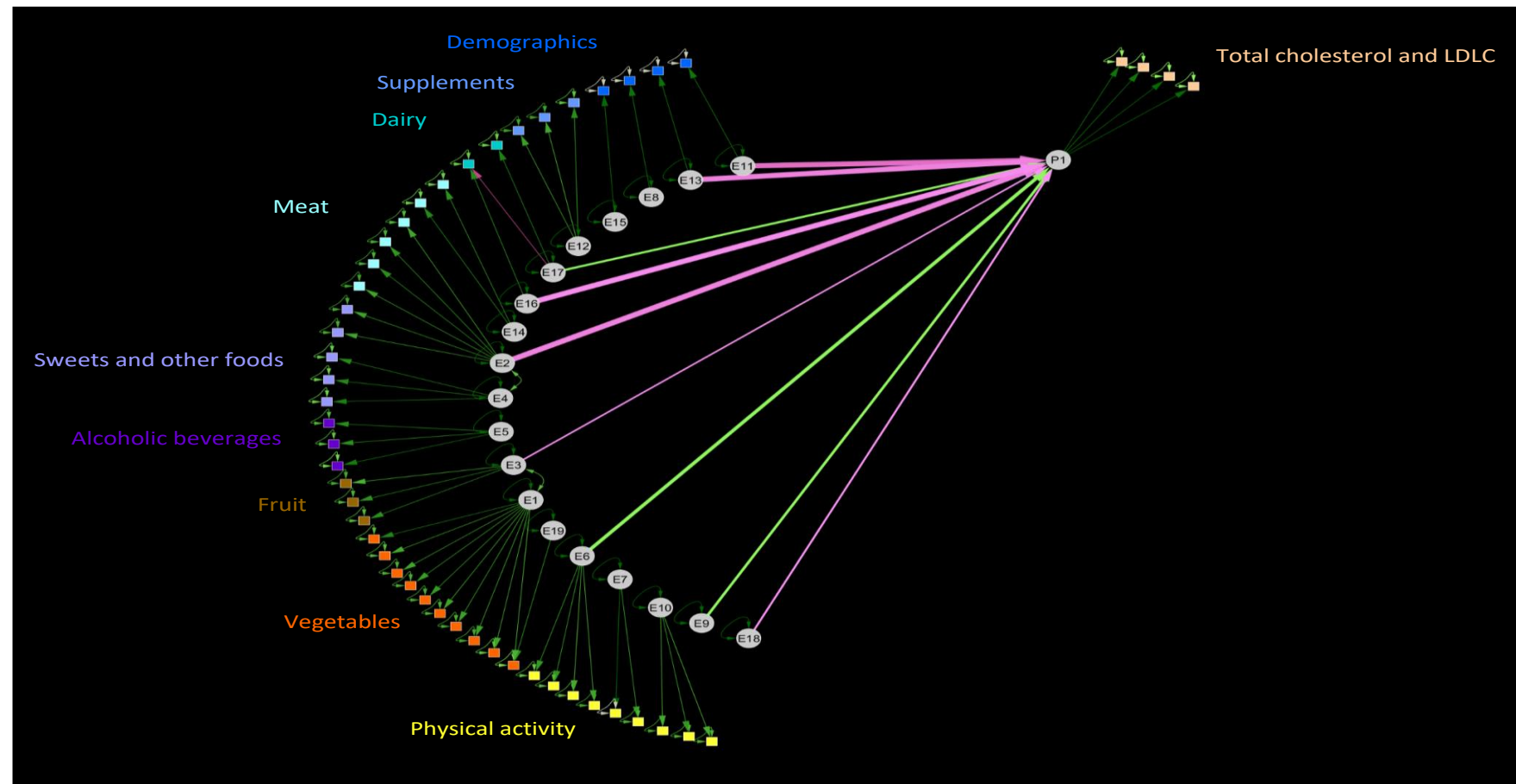
LEVEL  
02  
NUTRIENT GROUPS

LEVEL  
03  
FOODS

LEVEL  
04  
FOOD GROUPS AND  
PATTERNS

LEVEL  
05  
EXPOSOME

In the MVP, there are structural relationships between diet, lifestyle, and demographic exposures and subsequent markers of cardiometabolic health.



## AGENDA

# The future potential arising from our strategic assessment of diet in the MVP

MVP's valid dietary assessment...

at all levels of hierarchy and granularity...

**combined with risk factor assessments...**

**and the world's largest genetic collection...**

**provides a detailed picture of health...**

to address the central questions.

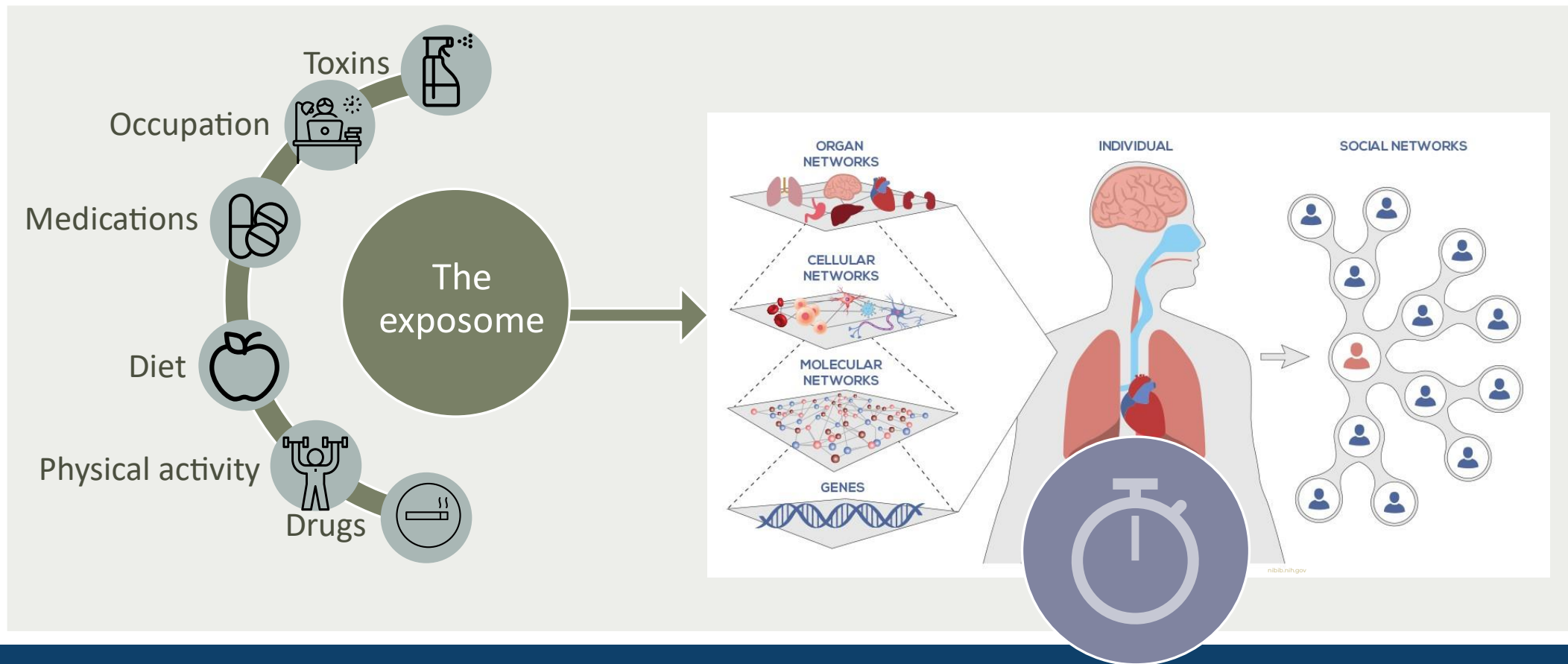


## 3-5. WEALTH OF MVP DATA

# There is added value of integrating nutrition data with demographic, health and genetic data

### MVP pulls together data from:

- Collected biospecimens (e.g., blood)
- Linked electronic health records and external databases
- Administered questionnaires





### 3-5. WEALTH OF MVP DATA

## MVP represents a one-of-a-kind combination of the following data types and sources:

With the goal of improving Veteran's health, full integration of the unique MVP data will enable us to build a more comprehensive picture of disease determinants.



World class, detailed, and curated, dietary assessment

One of the largest collections of genetic data in the world

Geodemographic analysis

Extensive assessment of the exposome

In-depth health and disease phenotyping

**Longitudinal  
MVP data**

## AGENDA

# The future potential arising from our strategic assessment of diet in the MVP

MVP's valid dietary assessment...

at all levels of hierarchy and granularity...

combined with risk factor assessments...

and the world's largest genetic collection...

provides a detailed picture of health...

**to address the central questions.**

1

2

3

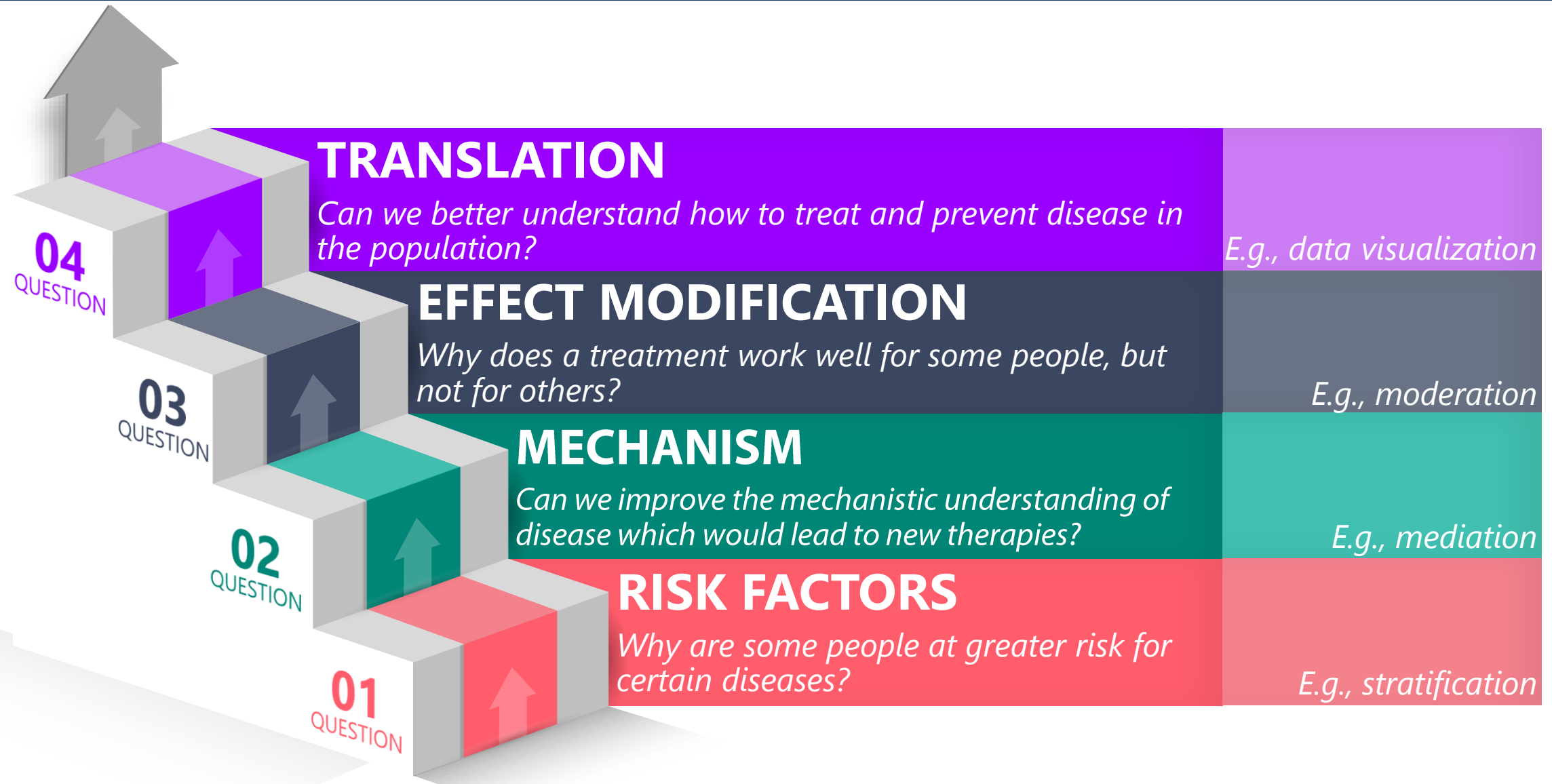
4

5

6

## ADDRESSING THE CENTRAL QUESTIONS

# MVP nutrition data represents an essential tool for answering central Veteran health questions



## WHAT WE HAVE LEARNED SO FAR

# Real-world implications for US Veterans

In the Million Veteran Program, we found that Veterans who ate more of the following foods had better heart health:

- **Yogurt**

- **KL Ivey, et al.** Clinical Nutrition ESPEN. 43 (2021)
- <https://www.sciencedirect.com/science/article/abs/pii/S2405457721001066>

- **Nuts**

- **KL Ivey, et al.** Nutrients. 13.9 (2021)
- <https://www.mdpi.com/2072-6643/13/9/3031>

- **Chocolate**

- **YL Ho, et al.** American Journal Of Clinical Nutrition. 113.5 (2021)
- <https://academic.oup.com/ajcn/article/113/5/1137/6154824>

- **Plant based foods**

- **DD Wang, et al.** Public Health Nutrition. (2022)
- <https://www.cambridge.org/core/journals/public-health-nutrition/article/>



**ACTION STEPS**

# MVP investigators can now integrate nutrition data into new and existing analytic protocols

**When there is a meaningful batch of FFQs completed, we will analyze another round of nutrient intakes**

**To facilitate implementation and integration of nutrition data, we have made available the following resources to MVP investigators:**

- **Documentation and recording**
  - CIPHER
- **Trainings and presentations**
  - Technical presentation during the Data Core office hours
    - September 15<sup>th</sup>, 2022, at 11am ET
    - Topics to be covered include
      - How to access data
      - Detailed introduction of data types
      - Resources for analyzing data
  - Validation study presentation during the Phenomics Working Group call
    - October 19<sup>th</sup>, 2022, at 1 pm ET
    - Topics to be covered include
      - Examples of practical implementation
      - Details of each validation analysis

**MVP investigators:** If you have an approved project in MVP and its in the approved scope, you can request data now

**Broader audience:** This has been an experience of gaining knowledge into incorporating nutrition data into projects. If you have or are planning data collection, we are happy to consult and provide input.

**For future MVP research opportunities/how to apply to use MVP data contact:** [MVPLOI@va.gov](mailto:MVPLOI@va.gov)

# Acknowledgements & Key Personnel



MVP Program Director: Sumitra Muralidhar

MVP PIs: J. Michael Gaziano & Philip Tsao

MVP Executive Leadership Lead: JP Casas

MVP Domain Leads

- Cohort Management : Stacey Whitbourne
- Data Core : Kelly Cho
- Genomics: Saiju Pyarajan
- Recruitment Informatics : Alex Shahpoor
- Regulatory Affairs : Lori Churby
- Biorepository: Luis Selva

MVP Data Core – Nutrition Team

Lead: Luc Djousse

Mai Nguyen

Kerry Ivey

Yanping Li

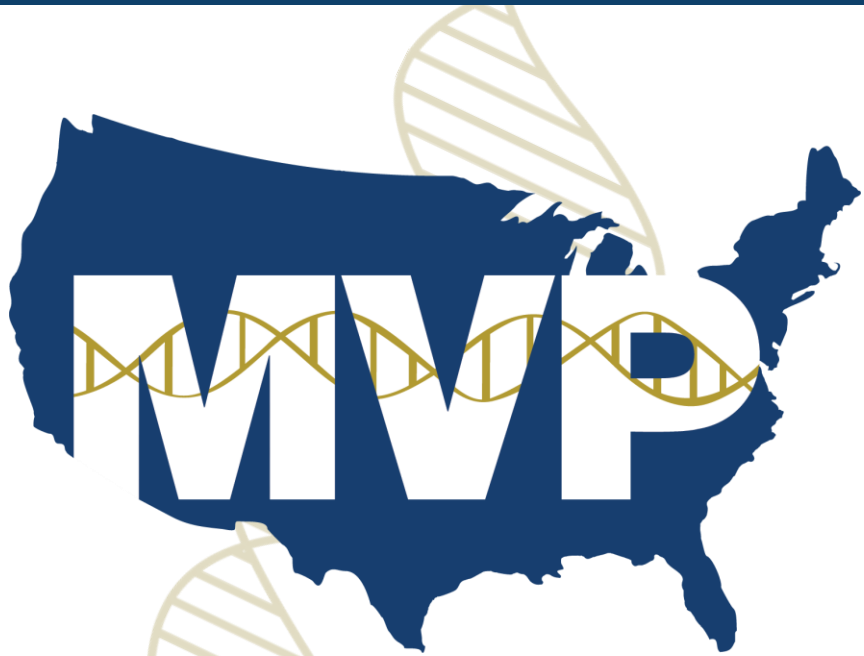
Daniel Wang

HSPH Nutrition Service

Frank Hu

Walter Willett

Laura Sampson



Thank you to all the  
Veterans who have  
helped make MVP  
possible.

**VA**



U.S. Department  
of Veterans Affairs

DISCOVERY ★ INNOVATION ★ ADVANCEMENT