

Will precision nutrition help us achieve greater health equity?

Christina A. Roberto, PhD
Mitchell J. Blutt & Margo Krody Blutt
Presidential Associate Professor of Health Policy



**No conflicts of interest to
disclose**

**Will precision nutrition help us
achieve greater health equity?**

Maybe. But I'm skeptical.

VIEWPOINT

Precision Nutrition—the Answer to “What to Eat to Stay Healthy”

Griffin P. Rodgers, MD
National Institutes of
Health, Bethesda,
Maryland.

**Francis S. Collins, MD,
PhD**
National Institutes of
Health, Bethesda,
Maryland.

The long-recognized centrality and importance of nutrition for good health naturally lead to the practical question of what to eat to stay healthy.

Many studies have revealed profound differences among individuals in disease risk and biological responses to diet, making it challenging to fully answer this question. This necessitates moving beyond a one-size-fits-all dietary prescription for optimal health and disease prevention.

The modern view of food and medicine has led to a substantial shift in nutrition research and practice known as precision nutrition, which has great potential to offer multidimensional and dynamic nutrition recommendations. Like precision medicine, the field of precision nutrition aims to understand the health effects of the complex interplay among genetics, microbiome, antibiotic and probiotic use, metabolism, food environment, and physical activity, as well as economic, social, and other behavioral characteristics. Only with a firm grasp of the contributions and interrelationships among these factors will it be possible to develop targeted nutrition guidance for diverse individuals in a highly diverse world

ability in COVID-19 morbidity and mortality, even in individuals without diet-related chronic disease.

Advancing the science of precision nutrition is needed to focus on the role of nutrition across the lifespan and address diet-related conditions through multifaceted interventions that go beyond choosing healthy foods. Poor nutrition is a key risk factor for a host of chronic diseases and conditions that are the leading causes of death and disability in the US—including cardiovascular disease and stroke, type 2 diabetes, obesity, cancers, and others—with associated health care costs estimated in the hundreds of billions of dollars annually.²

Recognizing the highly multidisciplinary nature of modern nutrition science, precision nutrition investigations will benefit from innovative technologies and interdisciplinary research alliances that should enable deciphering of the various roles (alone and together) of whole foods, individual nutrients, sociocultural influences on eating and lifestyle, societal infrastructure on the health of individuals and populations, and genome/microbiome variation between individuals.

The promise of precision medicine

- People differ in disease risk & biological response to diet
- It's appealing to give tailored nutrition advice vs. "one-size-fits-all"
- Goals of precision nutrition:
"to understand the health effects of the complex interplay among genetics, microbiome, antibiotic and probiotic use, metabolism, food environment, and physical activity, as well as economic, social, and other behavioral characteristics."

But much of the focus is on individual-level biology & technologies vs. environmental factors

Individual-level

Genomics

Microbiome

Neurobiology

Wearable devices

Mobile technologies

Vs.

Environmental Forces

Neighborhoods &
community context

Economic & social
policies

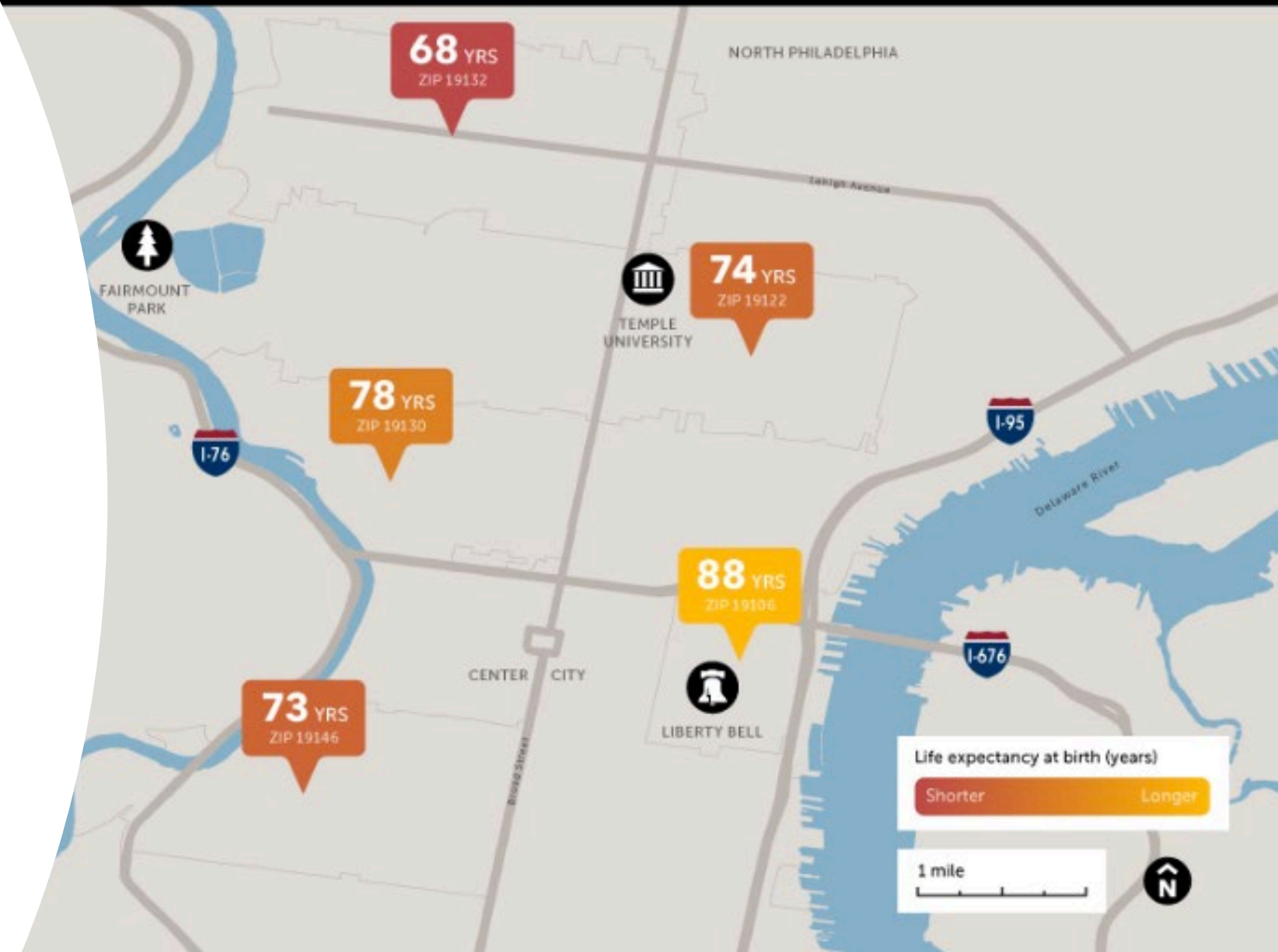
Political systems

Corporations

Social norms

Philadelphia Life Expectancy

20 yr diff. in life expectancy based on zip code



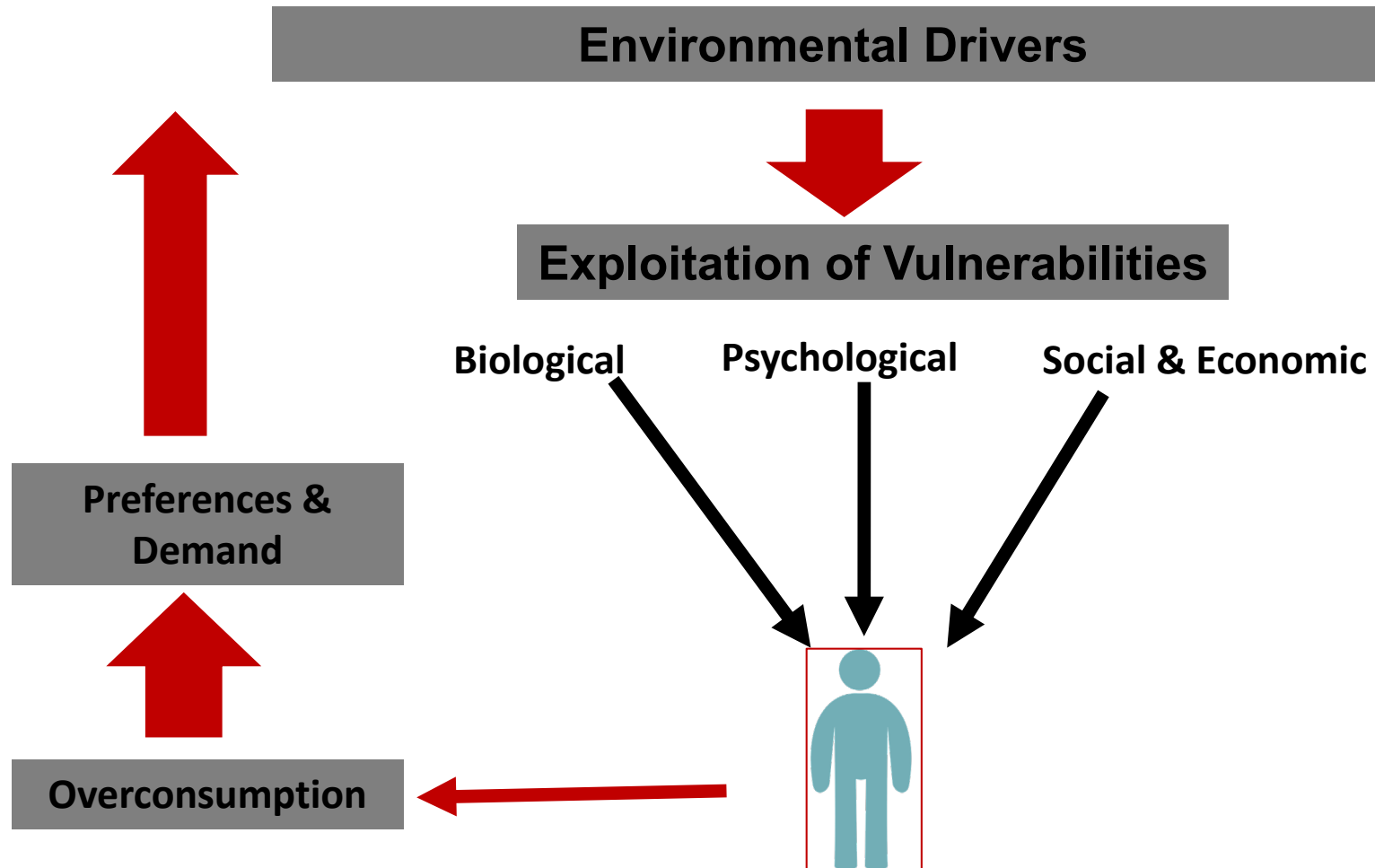
New Orleans
– 25 year
difference



Can precision
nutrition fix
that?



Vicious Cycle of Unhealthy Dietary Habits





Why am I skeptical?

60% of U.S. adults have a diet-related chronic disease

Many people have difficulty adhering to dietary guidelines...even when simple messages like eat more fruits & vegetables have been consistent for decades.

More targeted advice alone won't fix that

If we just knew more....

- Knowledge is not the only barrier and often not the main barrier
- Adhering to dietary advice gets even more complicated for disease-specific diets like type 2 diabetes

Figure I-1

Adherence of the U.S. Population to the *Dietary Guidelines* Over Time, as Measured by the Average Total Healthy Eating Index-2015 Scores



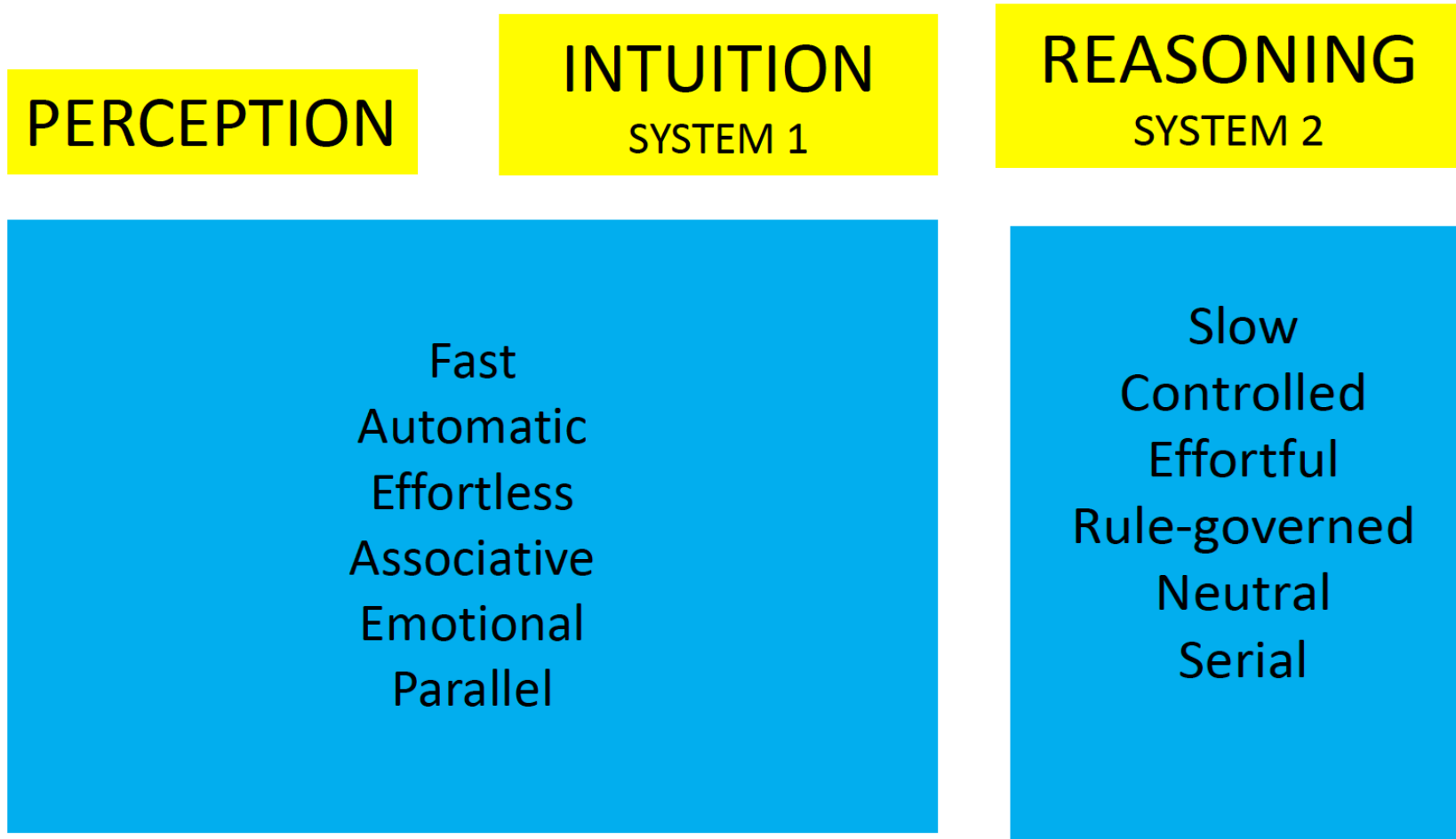
NOTE: HEI-2015 total scores are out of 100 possible points. A score of 100 indicates that recommendations on average were met or exceeded. A higher total score indicates a higher quality diet.

Data Source: Analysis of What We Eat in America, National Health and Nutrition Examination Survey (NHANES) data from 2005-2006 through 2015-2016, ages 2 and older, day 1 dietary intake data, weighted.

A top-down view of a market stall filled with various fresh produce. The produce is arranged in wooden crates and includes red and yellow bell peppers, green cucumbers, green beans, green peas, red tomatoes, purple eggplants, yellow lemons, red radishes, green lettuce, and green herbs. The text is overlaid in the center of the image.

Why is it hard to
communicate
nutrition messages
to the public & change behavior?

Basic Psychology – memory is limited, information processing is effortful



Source: Daniel Kahneman, *Maps of Bounded Rationality: Psychology for Behavioral Economics* Nobel lecture, 2002.

Memorable & Actionable Guidelines: What good is a guideline people can't remember?

2005 Food Pyramid



A Sample Personalized Guideline – is it easy to remember? Is it motivating?

MyPyramid Plan

▶ **Grains**

9 ounces

▶ **Vegetables**

3.5 cups

▶ **Fruits**

2 cups

▶ **Milk**

3 cups

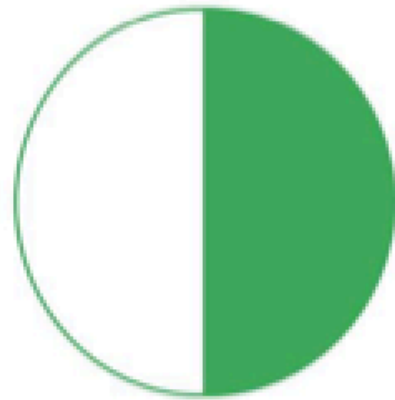
▶ **Meat & Beans**

6.5 ounces

Half Plate Guideline vs. MyPyramid

HALF-A-PLATE

Be sure to fill half of your plate at every meal with fruits and vegetables!



MyPyramid Plan

▶ Grains

9 ounces

▶ Vegetables

3.5 cups

▶ Fruits

2 cups

▶ Milk

3 cups

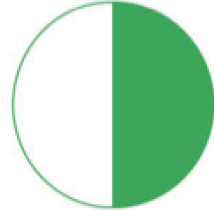
▶ Meat & Beans

6.5 ounces

Study

- Assessed motivation to follow nutritional guidelines
- Randomized to view either Half Plate OR MyPyramid

HALF-A-PLATE
Be sure to fill half of your plate at every meal with fruits and vegetables!



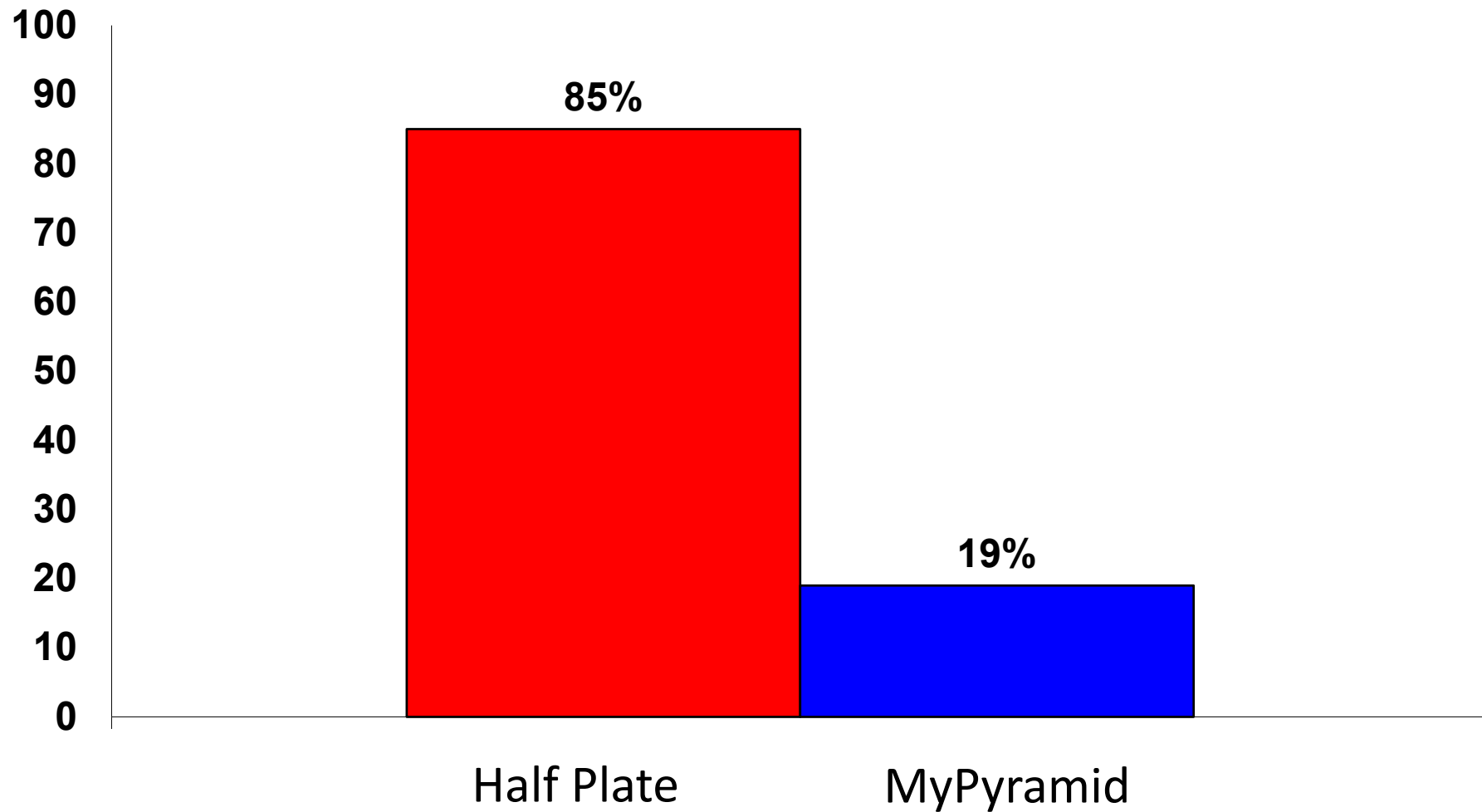
MyPyramid Plan

▶ Grains	9 ounces
▶ Vegetables	3.5 cups
▶ Fruits	2 cups
▶ Milk	3 cups
▶ Meat & Beans	6.5 ounces

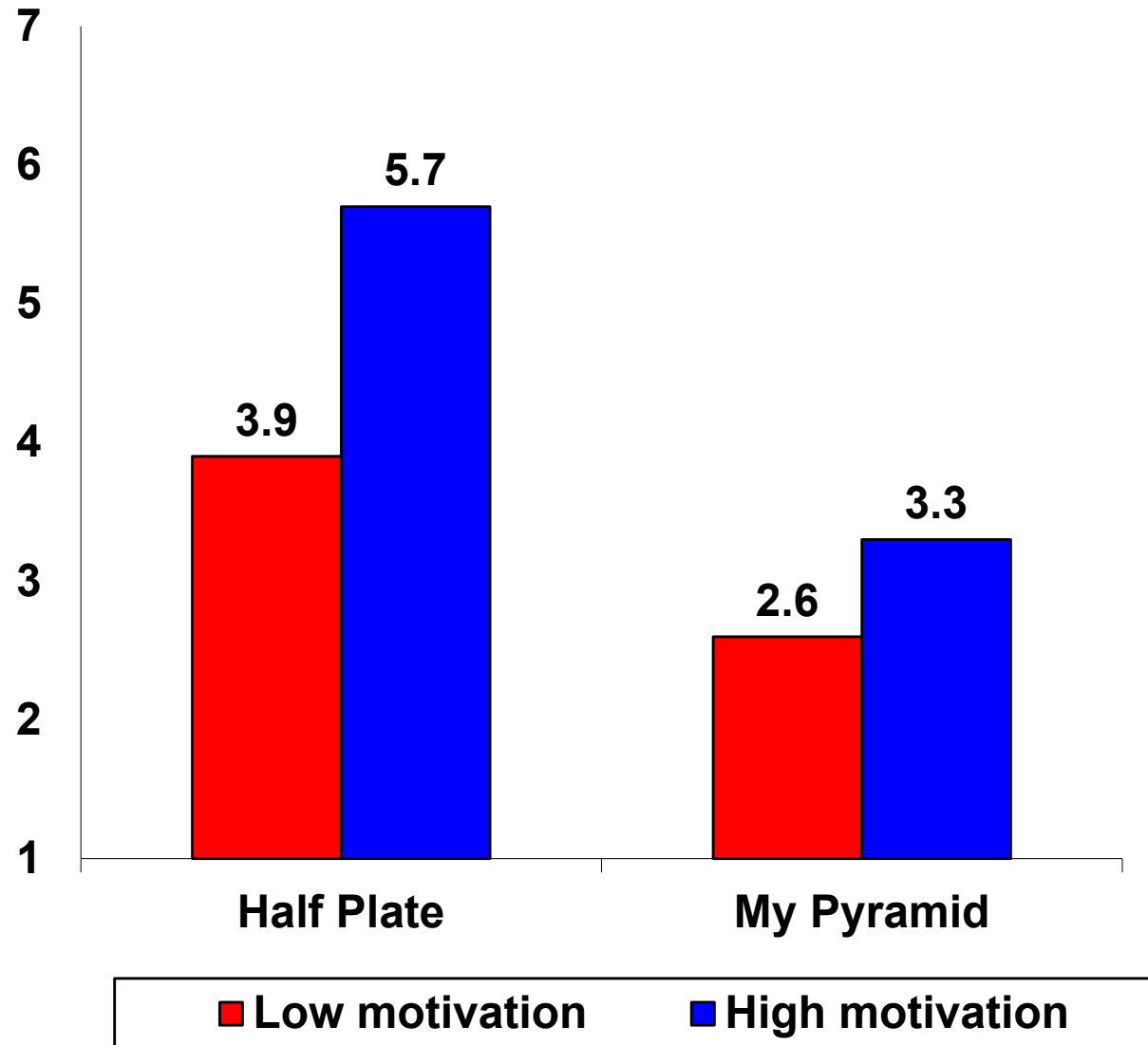
... NO DELAY

- Open-ended recall of the guideline
- How motivated are you to follow this guideline?

% with *Perfect* Immediate Recall



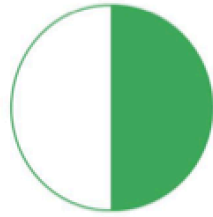
Motivation to Follow This Nutrition Guideline



Study: Can simple guidelines improve choice?

- Assessed motivation to follow nutritional guidelines
- Randomized to view either Half Plate OR MyPyramid

HALF-A-PLATE
Be sure to fill half of your plate at every meal with fruits and vegetables!



MyPyramid Plan	
▶ Grains	9 ounces
▶ Vegetables	3.5 cups
▶ Fruits	2 cups
▶ Milk	3 cups
▶ Meat & Beans	6.5 ounces

... ONE MONTH DELAY

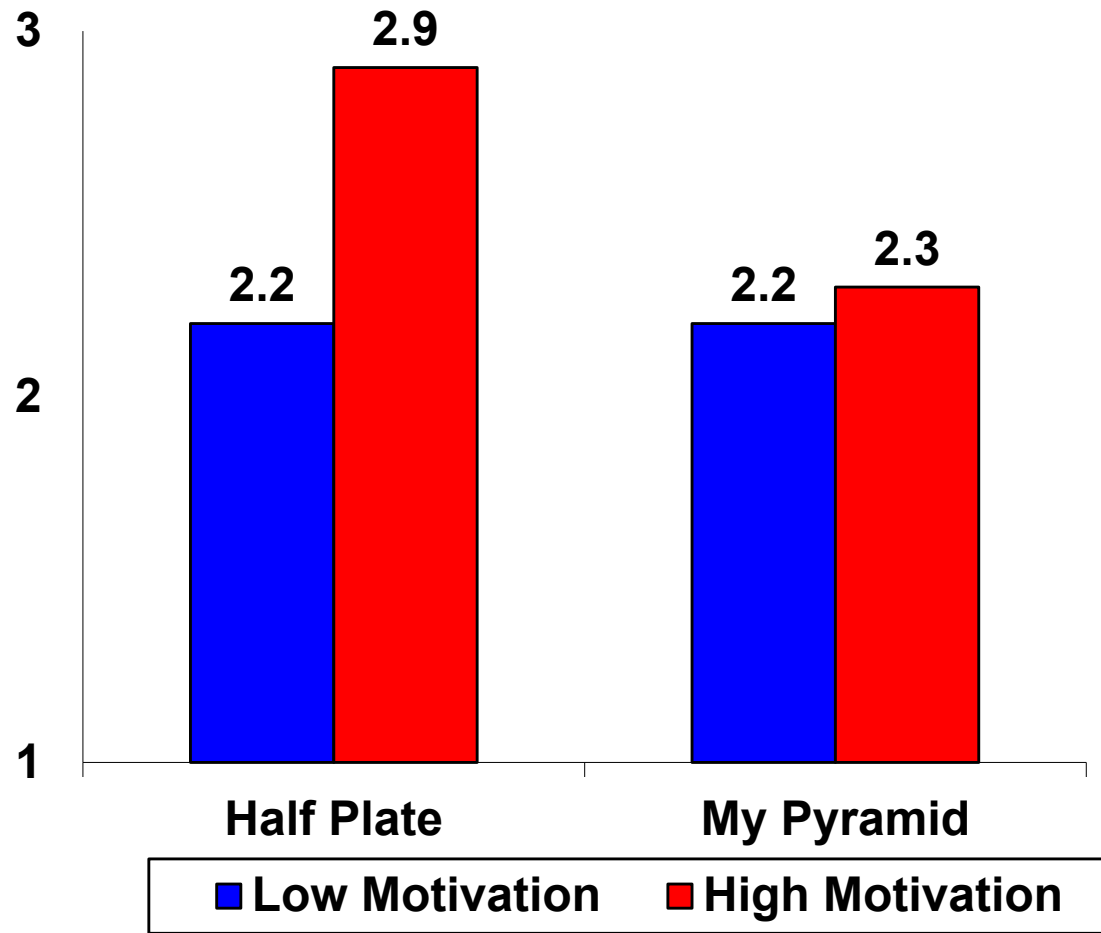
- Choice task
- Recall of quantities

Study 3: Choose 6 servings

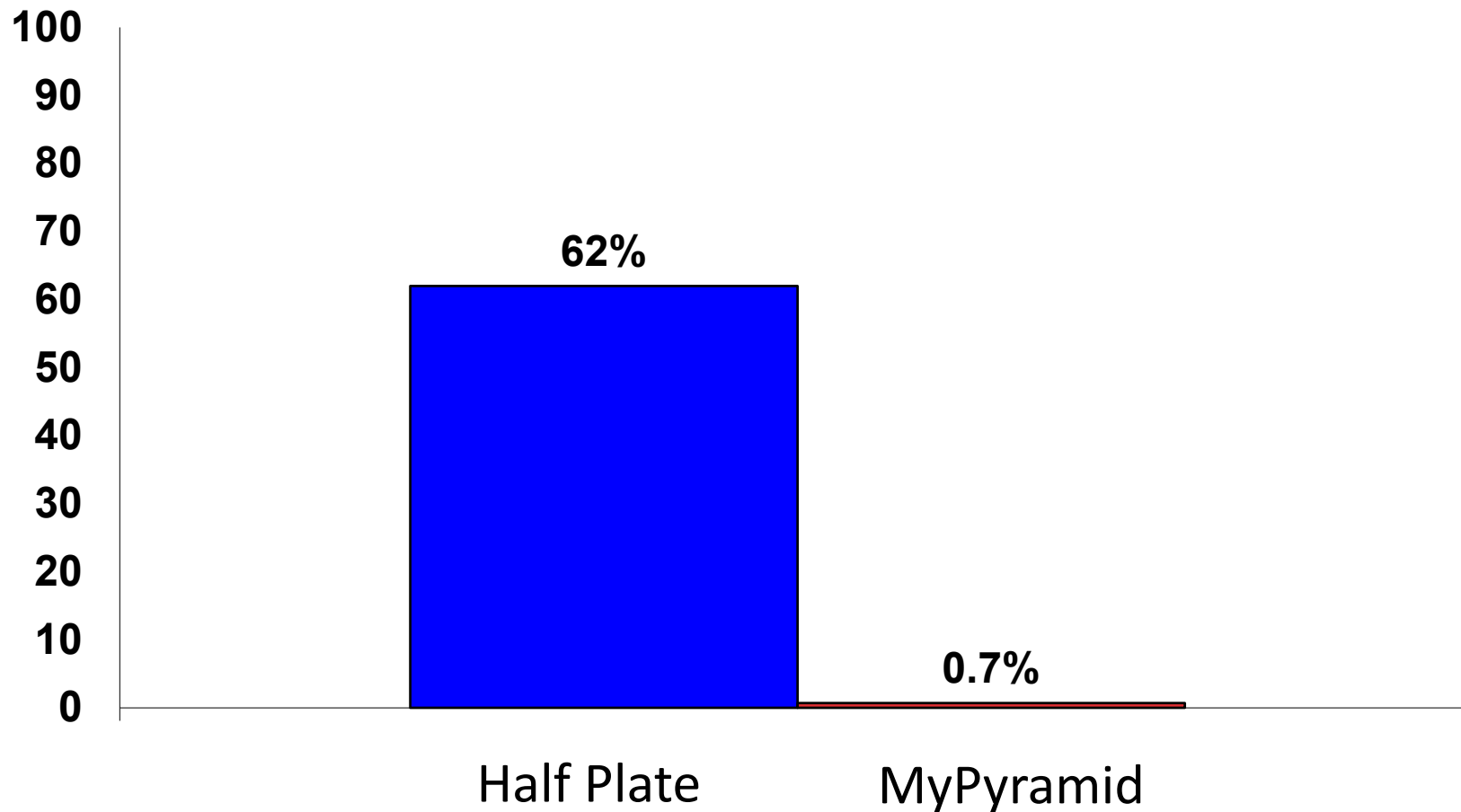
- Pesto pasta
- Roasted chicken
- Baked salmon
- Broiled scallops
- Roasted potato
- Sauteed spinach with garlic
- Roasted beets
- Tomato salad with cucumbers
- Fruit salad
- Chocolate cake
- Lemon shortbread cookie



of Fruits & Vegetables Chosen



% correctly recalling the amounts after one month



Simple guidelines have
ENORMOUS recall advantages



Those with the greatest resources might have the greatest access to precision nutrition & use it most – App Example



- Who is more likely to use health apps?

Data – 3,677 people

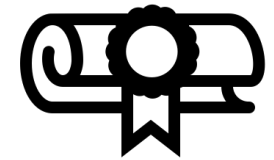
- Nationally representative, NCI 2015 Health Information National Trends Survey
- Data on mobile device & health app use



younger



women



Higher
educated

Precision nutrition can be exploited for profit – ex. of health-related marketing



Online shopping

Shop by diet

Groceries that fit your lifestyle

Organic

Shop organic >

Explore our bounty of organic products containing organic ingredients or raised with organic practices



365 Everyday Value, Organic Baby Spinach, 5 oz
★★★★☆ 38,111
\$2.29
Add to Cart



Organic Valley Large Brown Free Range Eggs, Original...
★★★★★ 13,907
\$4.99
Add to Cart



Organic Prairie Pasture Raised 85% Lean Organic...
★★★★☆ 3,384
\$10.69
Add to Cart



Dave's Killer Bread Organic 21 Whole Grains and Seed...
★★★★★ 11,144
\$5.34
Add to Cart



365 Everyday Value, Organic Trimmed Green Beans, 12 oz
★★★★☆ 7,305
\$3.99
Add to Cart

Keto

Shop keto >

Discover full-fat, non-starchy products, such as select protein and produce & more keto-friendly options



Large Organic Hass Avocado
★★★★★ 8,815
\$2.49
Add to Cart



MOWI Essential Atlantic Salmon Portions 2-portion...
★★★★★ 8,307
\$9.99
Add to Cart



365 by Whole Foods Market, Hass Avocados, 4 Count
★★★★★ 14,026
\$4.59
Add to Cart



BARNEY Almond Butter, Bare Smooth, No Sugar No Salt, ...
★★★★★ 1,310
\$6.99 \$7.99
Add to Cart



Healthy Choice Power Dressing Plant-Based Keto...
★★★★☆ 1,166
\$3.52
Add to Cart

Center for digital democracy: <https://www.democraticmedia.org/article/who-really-pushing-your-online-shopping-cart-you-buy-groceries-its-big-data-machine-learning>

Getting to health equity framework

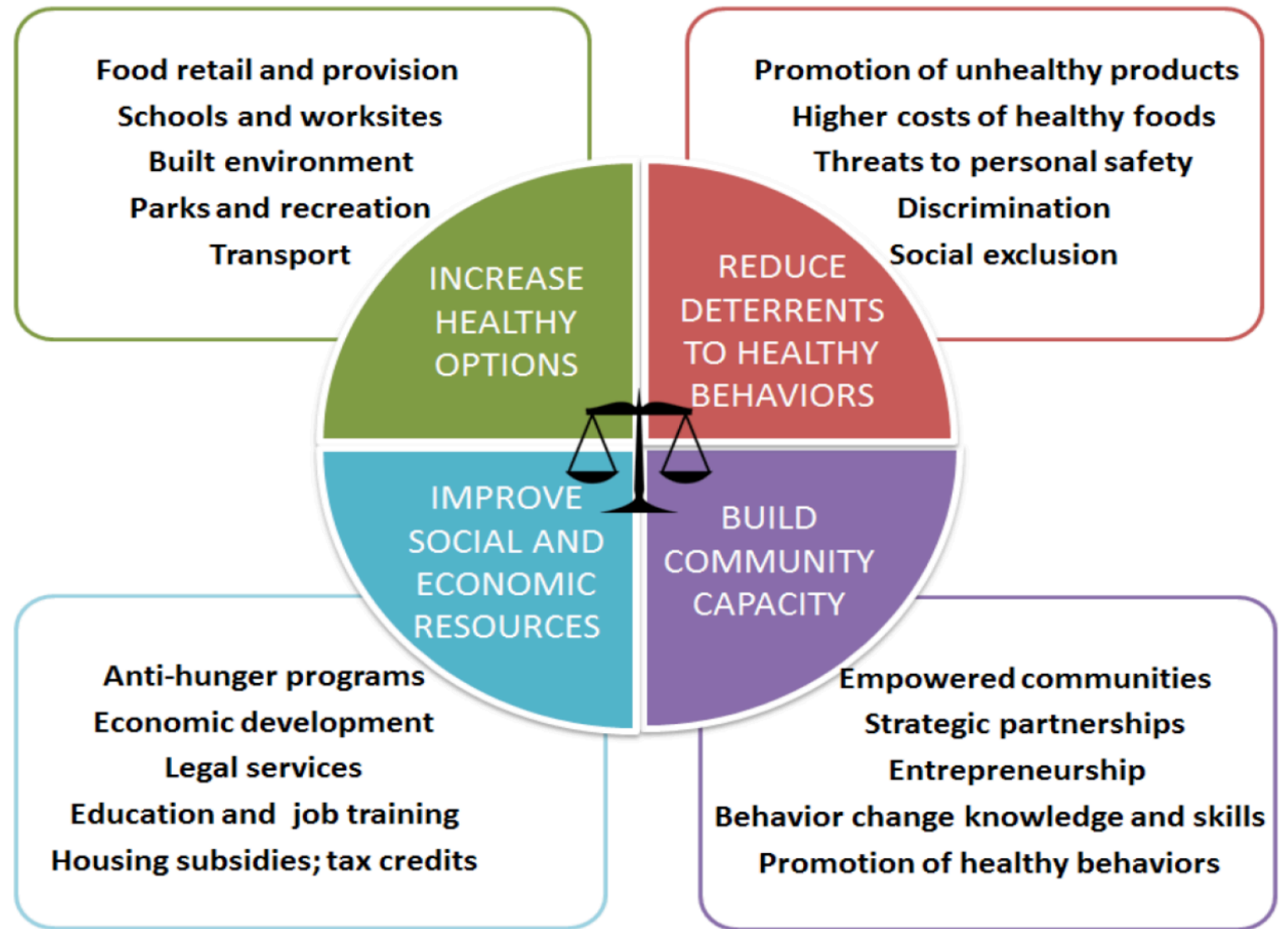


Figure 2 | Proposed equity-oriented obesity prevention action framework to assist in selecting or evaluating combinations of interventions that incorporate considerations related to social disadvantage and social determinants of health.



There is often a
disconnect
between
nutrition science
& most humans





PEACH LAB

PSYCHOLOGY OF EATING
AND CONSUMER HEALTH LAB

croberto@pennmedicine.upenn.edu

www.peachlab.org

@RobertoCA