

Integrating Food and Nutrition into Oncology Care Through “Food is Medicine” Interventions

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No conflict of interest to disclose.

WCE

WORLD CONGRESS OF EPIDEMIOLOGY 2024



Poor diet contributes to the largest number of deaths in the US and globally

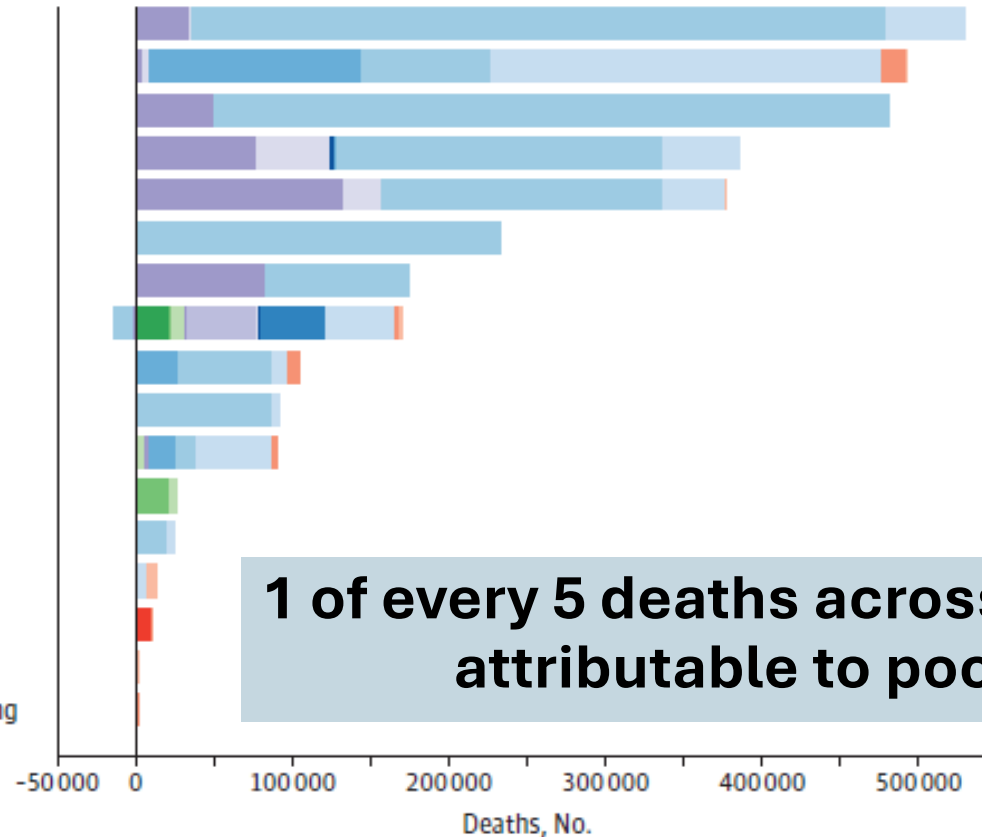
JAMA | Original Investigation

The State of US Health, 1990-2016

Burden of Diseases, Injuries, and Risk Factors Among US States

Risk factors

- Dietary risks
- Tobacco use
- High systolic blood pressure
- High body mass index
- High fasting plasma glucose
- High total cholesterol
- Impaired kidney function
- Alcohol and drug use
- Air pollution
- Low physical activity
- Occupational risks
- Low bone mineral density
- Residential radon and lead exposure
- Unsafe sex
- Child and maternal malnutrition
- Sexual abuse and violence
- Unsafe water, sanitation, and handwashing

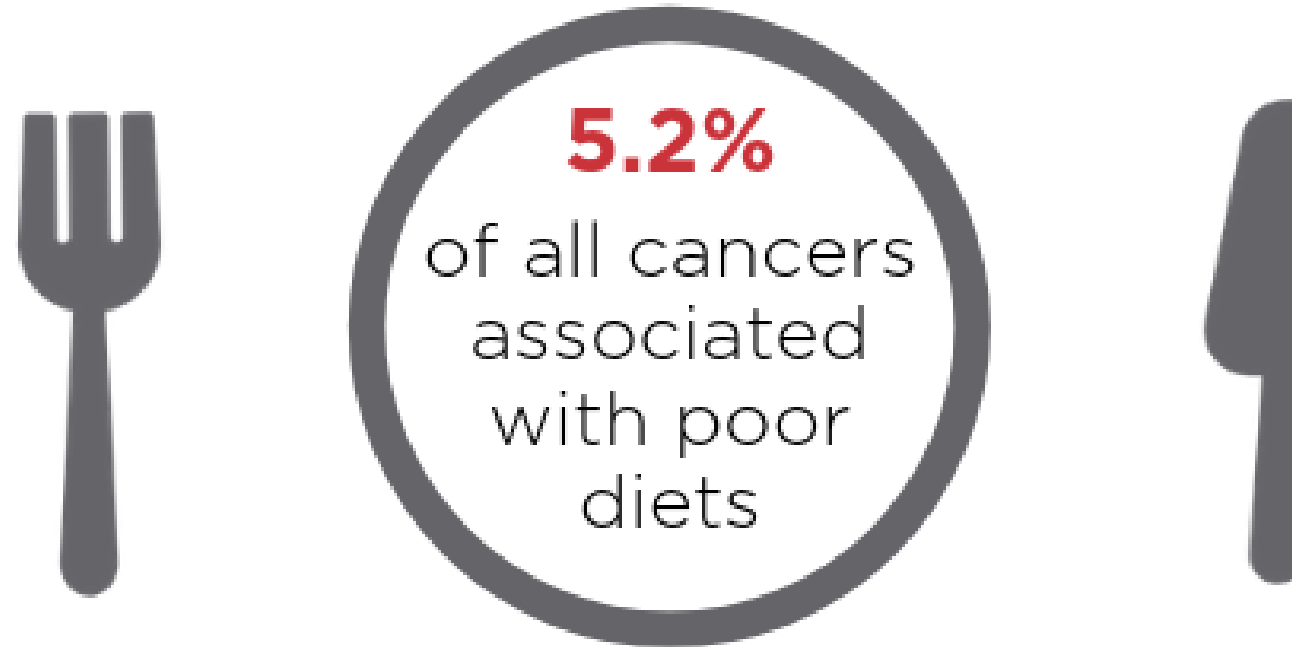


1 of every 5 deaths across the globe is attributable to poor diet.

- Communicable, maternal, neonatal, and nutritional diseases
 - HIV/AIDS and tuberculosis
 - Diarrhea, lower respiratory tract, and other common infectious diseases
 - Maternal disorders
 - Neonatal disorders
 - Nutritional deficiencies
 - Other communicable maternal, neonatal, and nutritional diseases
- Noncommunicable diseases
 - Neoplasms
 - Cardiovascular diseases
 - Chronic respiratory diseases
 - Cirrhosis and other chronic liver diseases
 - Digestive diseases
 - Neurological disorders
 - Mental and substance use disorders
 - Diabetes, urogenital, blood, and endocrine diseases
 - Musculoskeletal disorders
 - Other noncommunicable diseases

How many cancer cases are caused by poor diet?

The cancer burden of diet



Zhang, F. F., et al. Preventable cancer burden associated with dietary intake in the United States. JNCI Cancer Spectrum (2019). <http://doi.org/10.1093/jnci/djz079>

Gerald J. and Dorothy R. Friedman
School of Nutrition Science and Policy
at Tufts University

Diet and Cancer Risk

1



Fruits

2



Vegetables

3



Whole grains

4



Dairy foods

5



Processed meat

6



Red meat

7



Sugar-
sweetened
beverages

Cancer burden attributable to lifestyle factors

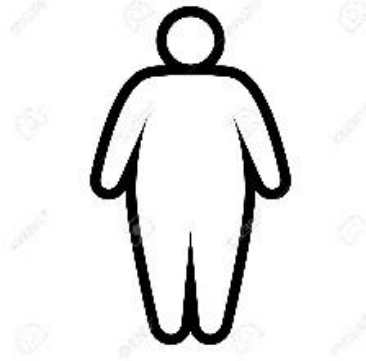
Poor Diet
5%



Alcohol
4-6%



Obesity
7-8%



Physical Inactivity
2-3%



Malnutrition includes both under- and over-nutrition



Malnutrition and cancer outcomes

Treatment toxicities & complications

Treatment interruptions

Morbidity & mortality

Readmissions & lengths of stay

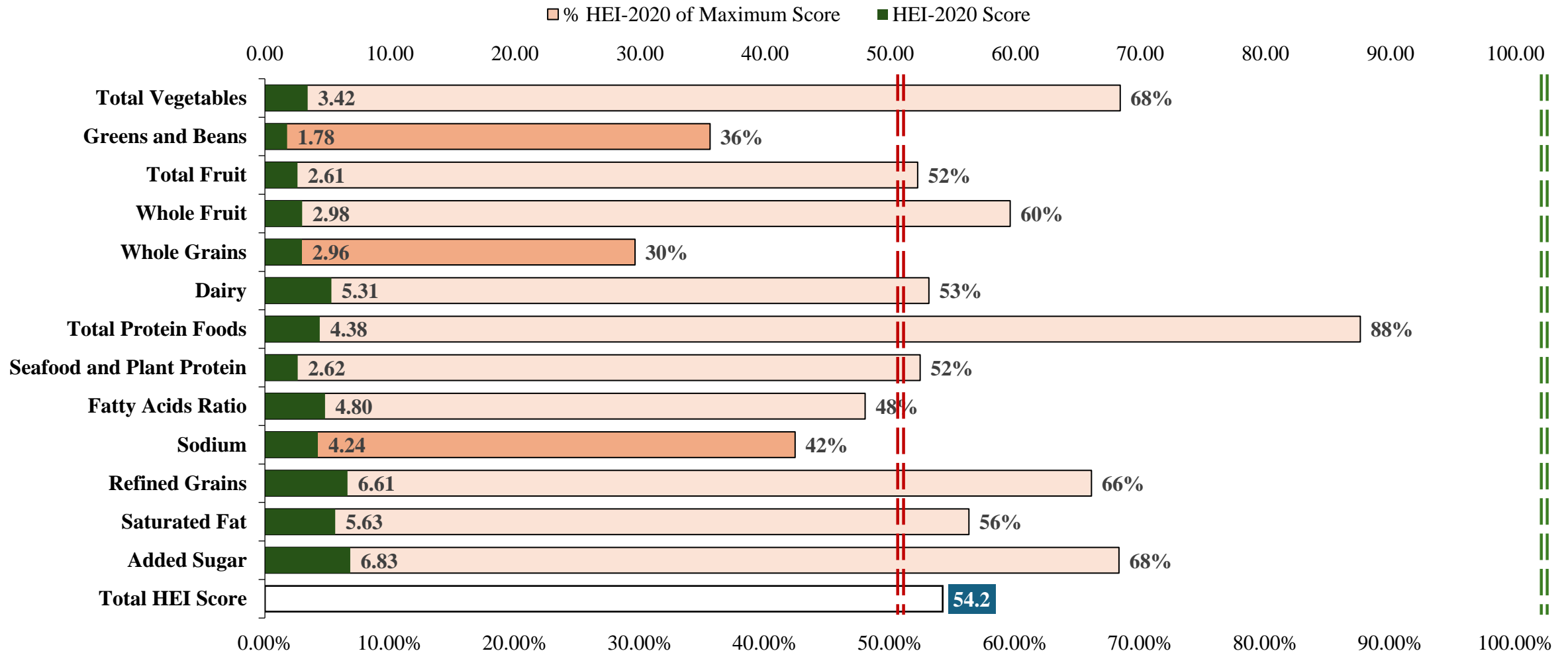
Tolerance to treatment & treatment completion

Functional performance

Quality of life

Survival

Poor diet quality in adult cancer survivors (n=3,806) in the United States, NHANES 1999-2018



A horizontal banner with a dark, starry night sky background. The text is centered and white. The background shows silhouettes of trees and a faint archway.

Los Angeles Times

Science Now

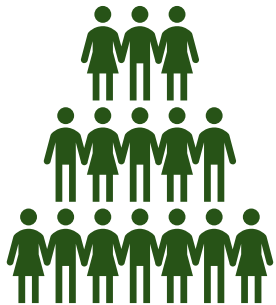
Discoveries from the world of science and medicine

After cancer, survivors do not choose healthy foods: What's going on?

Health system barriers for cancer patients and survivors to achieve optimal nutrition



Oncology care providers have limited time and capacity in providing nutrition care.

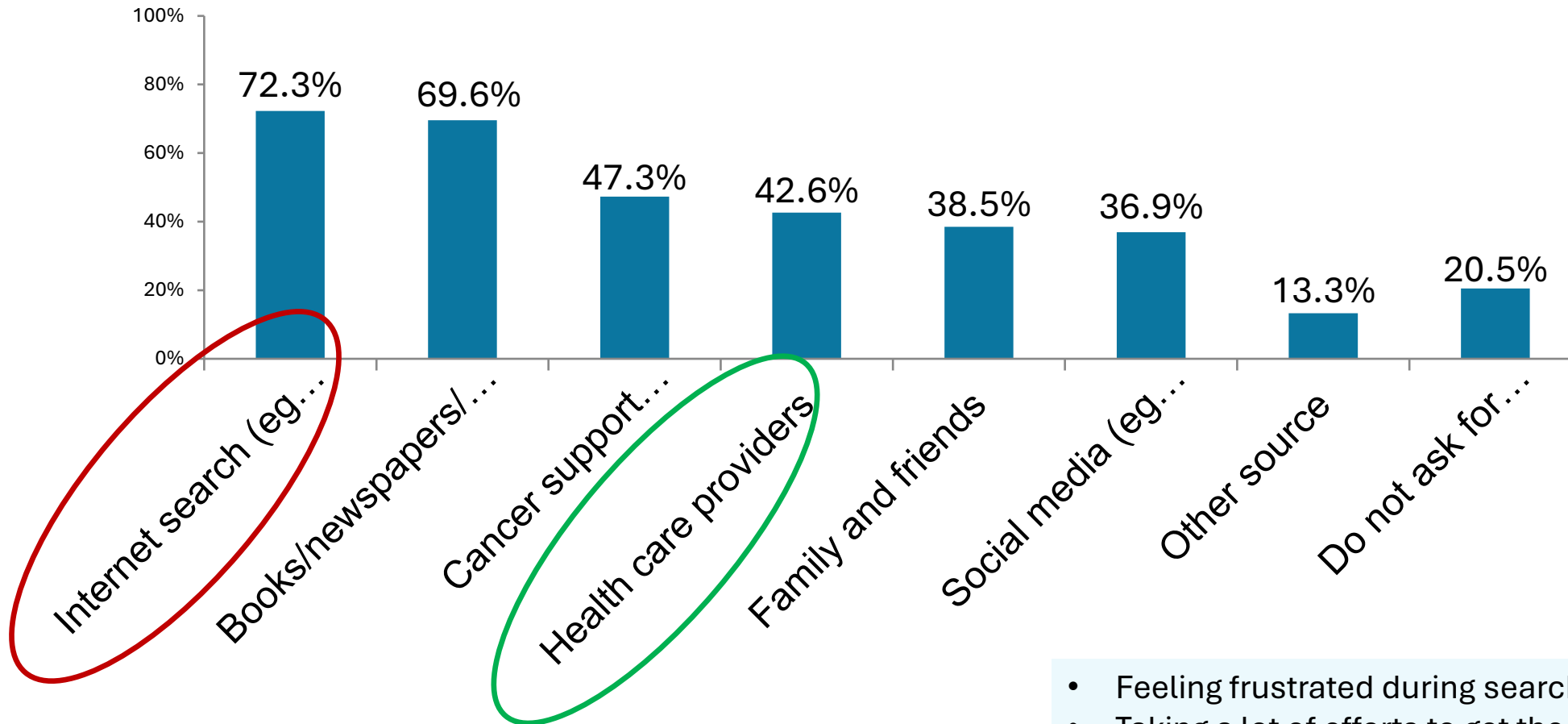


Only 1 registered dietitian for every >2,300 cancer patients in the United States.



Less than 60% of the malnourished cancer patients receive any nutrition intervention.

Sources for seeking nutrition advice in cancer patients and survivors

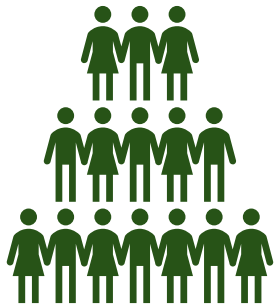


- Feeling frustrated during search
- Taking a lot of efforts to get the information
- Being concerned about the quality of the information
- Information too hard to understand

System level barriers for cancer patients and survivors to achieve optimal nutrition



Oncology care providers have limited time and capacity in providing nutrition care.

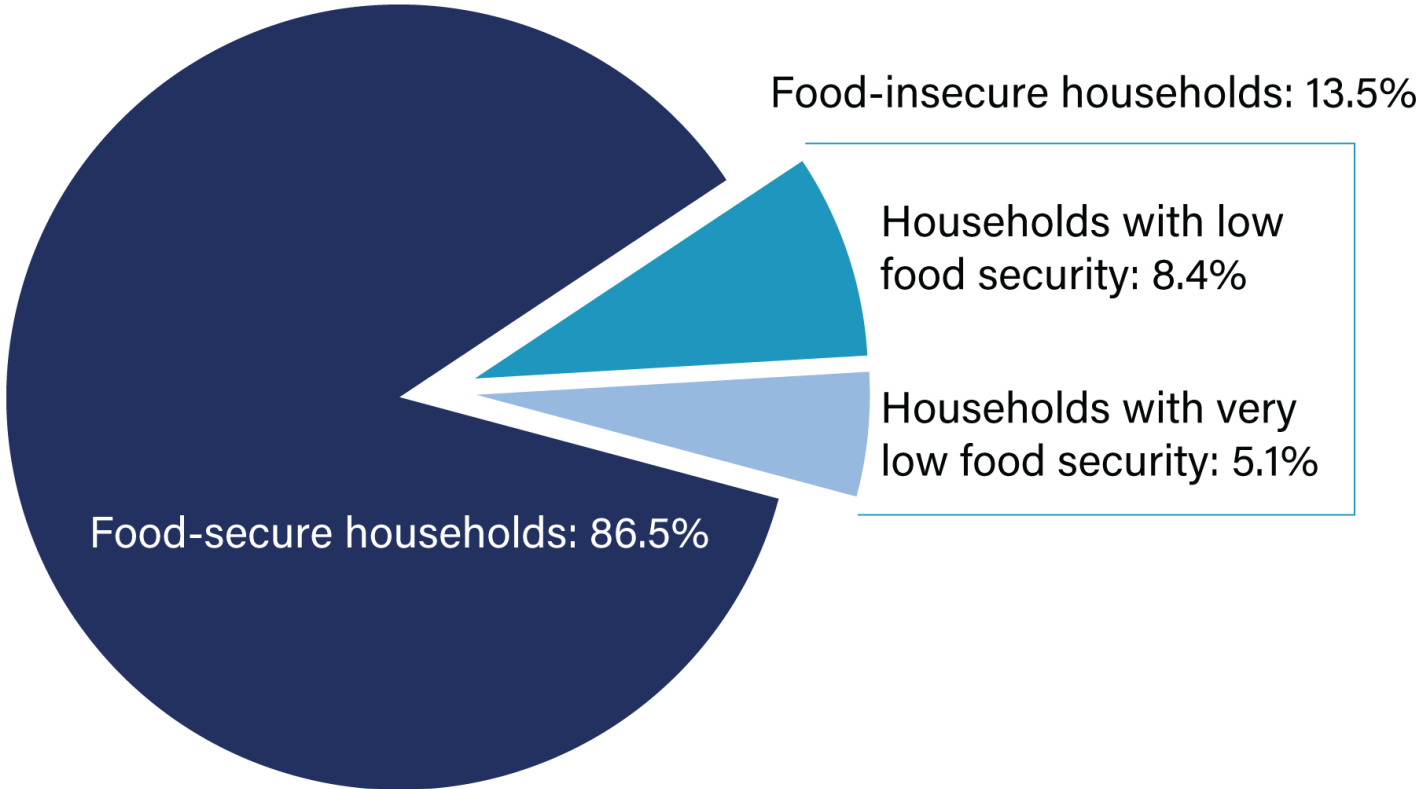


Only 1 registered dietitian for every >2,300 cancer patients in the United States.



>50% cancer patients with low income or from minority groups are **food insecure**.

US households by food insecurity status, 2023



Food insecurity is a household-level economic and social condition of limited and uncertain access to adequate food (USDA)

Nutrition security is more than food security

WHAT IS NUTRITION SECURITY?

Consistent access to nutritious foods that promote optimal health and well-being for all Americans, throughout all stages of life.



USDA

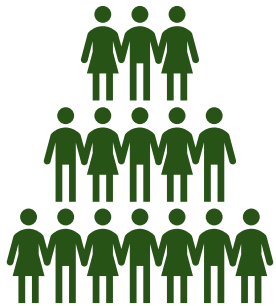
Nutrition security is access, availability, and affordability of foods and beverages that promote well-being and prevent or treat diseases.

USDA

System-level barriers for cancer patients and survivors to achieve optimal nutrition



Oncology care providers have limited time and capacity in providing nutrition care.



Only 1 registered dietitian for every >2,300 cancer patients in the United States.



>50% cancer patients with low income or from minority groups are food or nutrition insecure.

System-level approach to integrate nutrition and health



Screen patients for food and nutrition security



Refer eligible patients to food-based interventions designed for patients with specific health conditions.



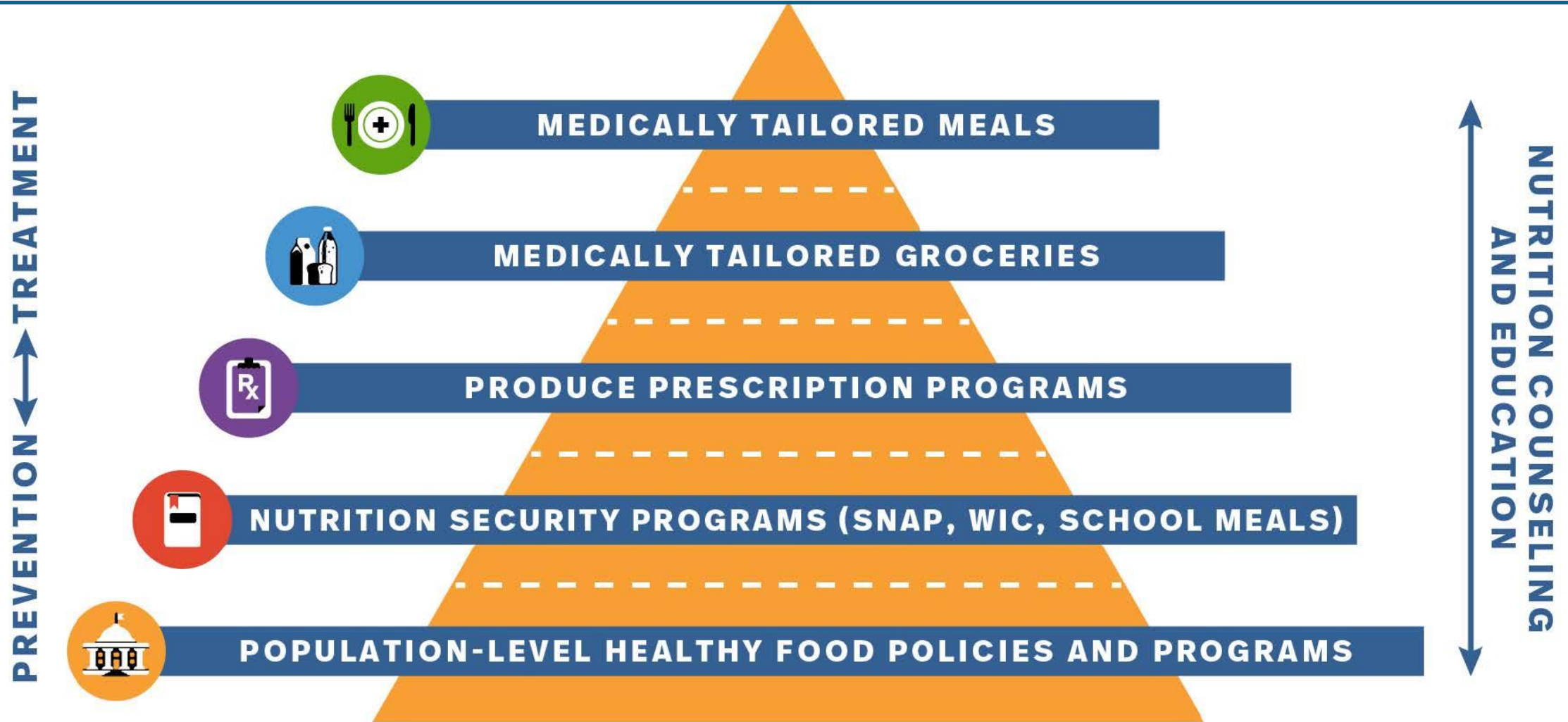
Build infrastructure in health systems and policy for reimbursement

“Food is Medicine” Interventions

Food-based nutritional interventions integrated within health systems to treat or prevent disease and advance health equity



“Food Is Medicine” Interventions



Primary types of “Food Is Medicine” programs for patients with specific health conditions - MTMs

Medically Tailored Meals (MTMs)



- Fully prepared, nutritionally tailored meals to individuals living with complex and/or advanced diet-sensitive medical conditions (e.g., heart failure, end-stage renal disease, poorly controlled diabetes, cancer, HIV/AIDS); limit activities of daily living; high burden of disability & health care utilization

- Some MTM examples (home delivery or pick-up)
 - Renal (low potassium, low phosphorus, low sodium)
 - Diabetic or heart-healthy (carbohydrate and sodium controlled)
 - Texture-modified diet (soft, pureed for easy chew and swallow)
 - High protein/high calorie (moderate to severe unintentional weight loss)
- Nutrition assessment; opportunities for nutrition counseling
- 10-21 meals per week; short or long duration (often 3-6 months)
- Eligibility (health vs. social needs); focus (treatment vs. prevention)

Primary types of “Food Is Medicine” programs for patients with specific health conditions - MTGs

Medically Tailored Groceries (MTG)



- Pre-selected unprepared or lightly processed foods that provide a significant proportion of the ingredients for preparing nutritionally complete meals for patients with 1 or more complex diet-sensitive conditions or risk factors who are able to prepare their own meals.

- Some MTG examples:
 - Food boxes or meal kits that contain ingredients for preparing meals such as produce, whole grains, legumes, lean proteins, and spices
 - Recipes usually available; portioned by meal
 - Foods are pre-selected and approved by RDNs as appropriate for meeting the dietary needs of patients with the health condition or risk factor
- Home delivery or pick-up at a food bank or health care facility (“food pharmacy”)
- Nutrition information brochures, cooking classes, nutrition counseling

Primary types of “Food Is Medicine” programs for patients with specific health conditions - PRx

Produce Prescriptions (PRx)



- Prescriptions that are redeemed for produce at food retailers or farmers markets, allowing patients who are at risk or having diet-sensitive conditions to access healthy produce with no added sugar, salt, or fat, at low or no cost to the patients.

- PRx are usually for less ill individuals who are able to shop for food and prepare meals.
- Paper prescription (voucher), electronic benefit (card), or direct provision
- Produce generally fresh; can also be canned/frozen if no added sugar, salt for fat; some expanded it to include legumes and grains
- Redeemed at supermarkets, grocery stores, farmers markets; but can also be delivered to home or via pick-up
- Nutrition information brochures, cooking classes, nutrition counseling

Research on “Food Is Medicine” programs and health outcomes among patients with chronic diseases

- A growing body of evidence in the past decade, with an increasing use of “Food Is Medicine” programs within health care;
- Reduce food insecurity, improve dietary intake, and support mental health;
- Associated with improved health outcomes, including weight, blood pressure, and blood sugar control (HbA1c);
- Some documented reductions in health care utilization (such as fewer hospitalizations and ED visits) and reductions in health care costs.

Published studies evaluating “Food is Medicine” interventions on health outcomes, by intervention and outcome



Rosenberg et al, unpublished

**Very few studies evaluating “Food Is
Medicine” programs and health outcomes
among patients with cancer**



NUTRICARE

A RCT to evaluate a “Food is Medicine” intervention among vulnerable patients with lung cancer



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CANCER CENTER
TEMPLE HEALTH
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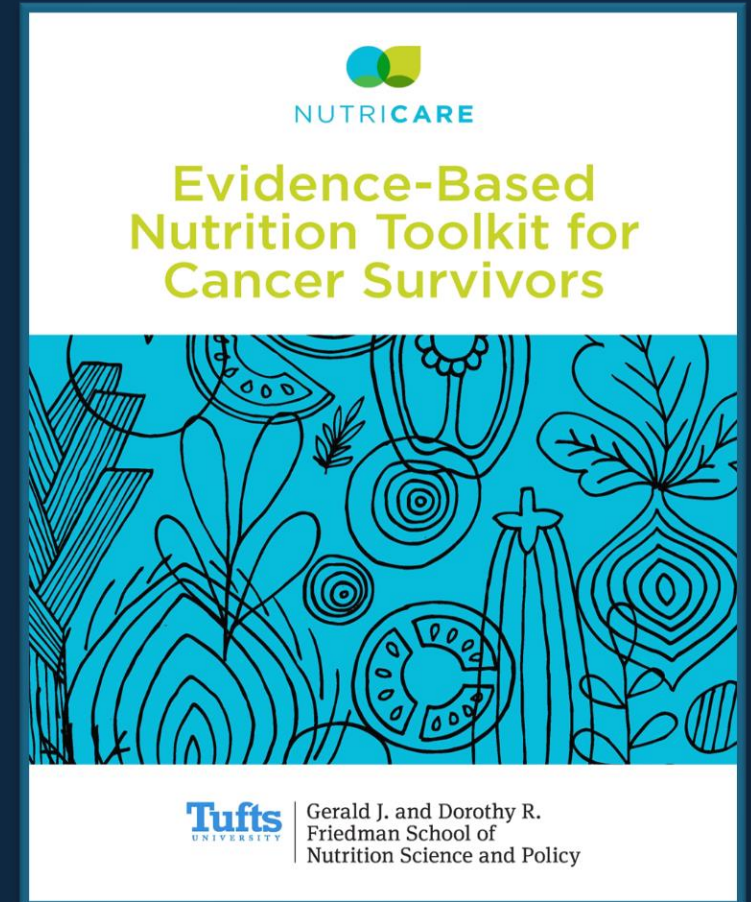
 Bristol Myers Squibb™ Foundation

NutriTool - Control Group

Printed Nutrition Toolkit for cancer survivors:

- Dietary intake recommendations during cancer treatment
- Strategies to manage nutrition impact symptoms
- Guidelines on maintaining a healthy weight during and after treatment
- Dietary guidelines for cancer survivors

Monthly nutrition newsletter via email



ADDING MORE SERVINGS OF FRUITS OR VEGETABLES			
	TAKE A...	AND ADD...	NUMBER OF 5 SERVINGS A DAY
BREAKFAST	A bowl of whole-grain cereals/oats	1 banana + 6 strawberries or 1/2 cup berries	2
	Omelets	1 large tomato + 1/2 cup cooked spinach + asparagus	2
	2 slices of whole-grain bread with cottage cheese	1/2 medium cucumber + 2 leaves of green leaves	2
LUNCH	Grilled chicken	Salad of 1/2 small avocado + 1 tomato	2
	Beans with brown rice in a wrap	1/2 sliced tomato + 1 cup parsley + onion	2
	Tuna sandwich with whole-grain bread	1/2 tomato + 2 lettuce + small bowl of garden salad	2
	Chicken noodle soup	110-inch celery stalks + 1 carrot, sliced + 1/2 onion	2.5
SNACK	Yogurt or cottage cheese	1/2 cup of fresh fruit (pineapple) + 1 tsp honey	2
	Hummus	1 carrot + 1 10-inch celery + 2-3 broccoli florets	2
	Peanut butter on 1 whole-grain slice of bread	1 banana	1
DINNER	1 fillet of salmon + rice	Small bowl side salad with colorful peppers + balsamic vinegar or low-fat sauce	2
	Whole grain pasta with low-fat cheese	1 cup of tomato sauce + 4 large mushrooms	2
	Grilled chicken burger in whole-grain bagel	2 x lettuce + medium cucumber + 2-3 slices of tomato	2.5

The rainbow of fruits and vegetables
The chart below illustrates a variety of different colors of fruits and vegetables and examples of what counts as one serving.

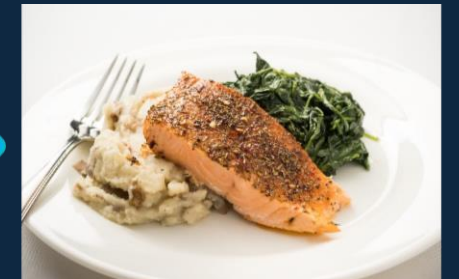
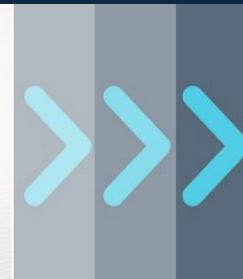
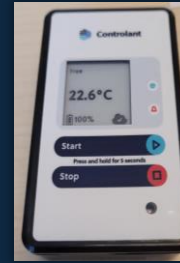
RED	YELLOW/GREEN	PURPLE/BLUE
1 small apple	1/2 cup of fresh fruit (pineapple) + 1 tsp honey	12 grapes
7 large berries	1 large tomato	2 large plums
1 large tomato	1 medium grapefruit	1 1/2 onions
1 1/2 cup of pomegranate seeds	1 1/2 cup of watermelon	1 cup blueberries
		2 beets
GREEN		WHITE/BROWN
2 spears of asparagus	1/2 medium cucumber	1/4 head of cauliflower
2 celery stalks	1 whole zucchini	1 large baked potato
6 small broccoli florets	2 large leaves of raw greens	4 large mushrooms
2 small kiwis		1 cup slices parsnip
		1 medium banana

NutriCare - Intervention Group



Medically Tailored Meals

- Dietitian approved & prescribed
- Home delivered
- Step-down phases (8 weeks each)



Nutrition Counseling

- Medical nutrition therapy
- Motivational interviewing
- Weekly & delivered remotely

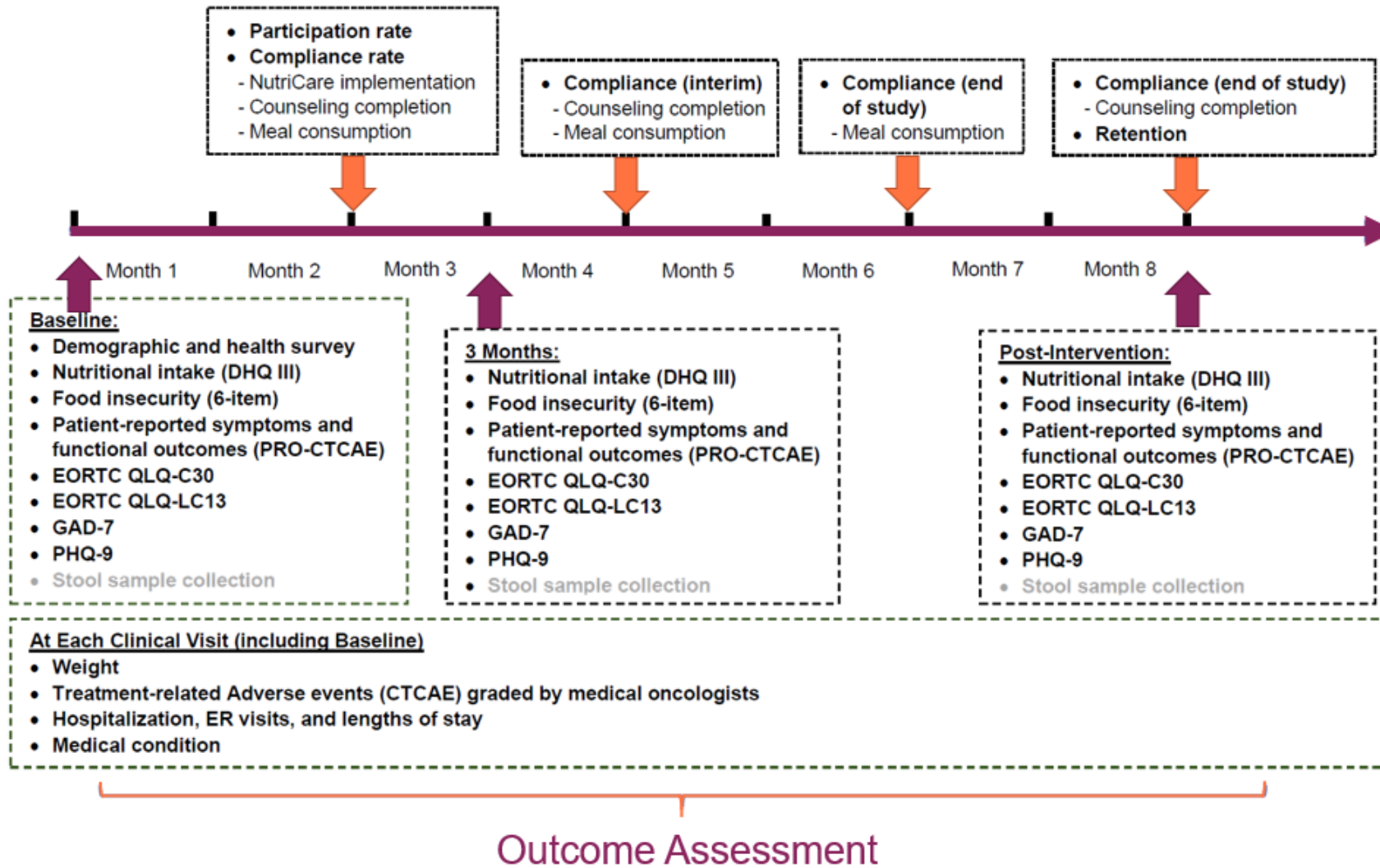
Prevention

Treatment

Post Treatment
Survivorship

SUPPORT OPTIMAL NUTRITIONAL STATUS

Primary and Secondary Outcomes



Primary Outcomes:

- Weight & BMI
- Diet quality
- Treatment interruptions (dose reduction and completion)

Secondary Outcomes:

- Treatment-related toxicities
- Quality of life
- Depression
- Anxiety
- Food security
- Malnutrition risk
- Hospitalizations & ED visits
- Gut microbiome

Participant Characteristics



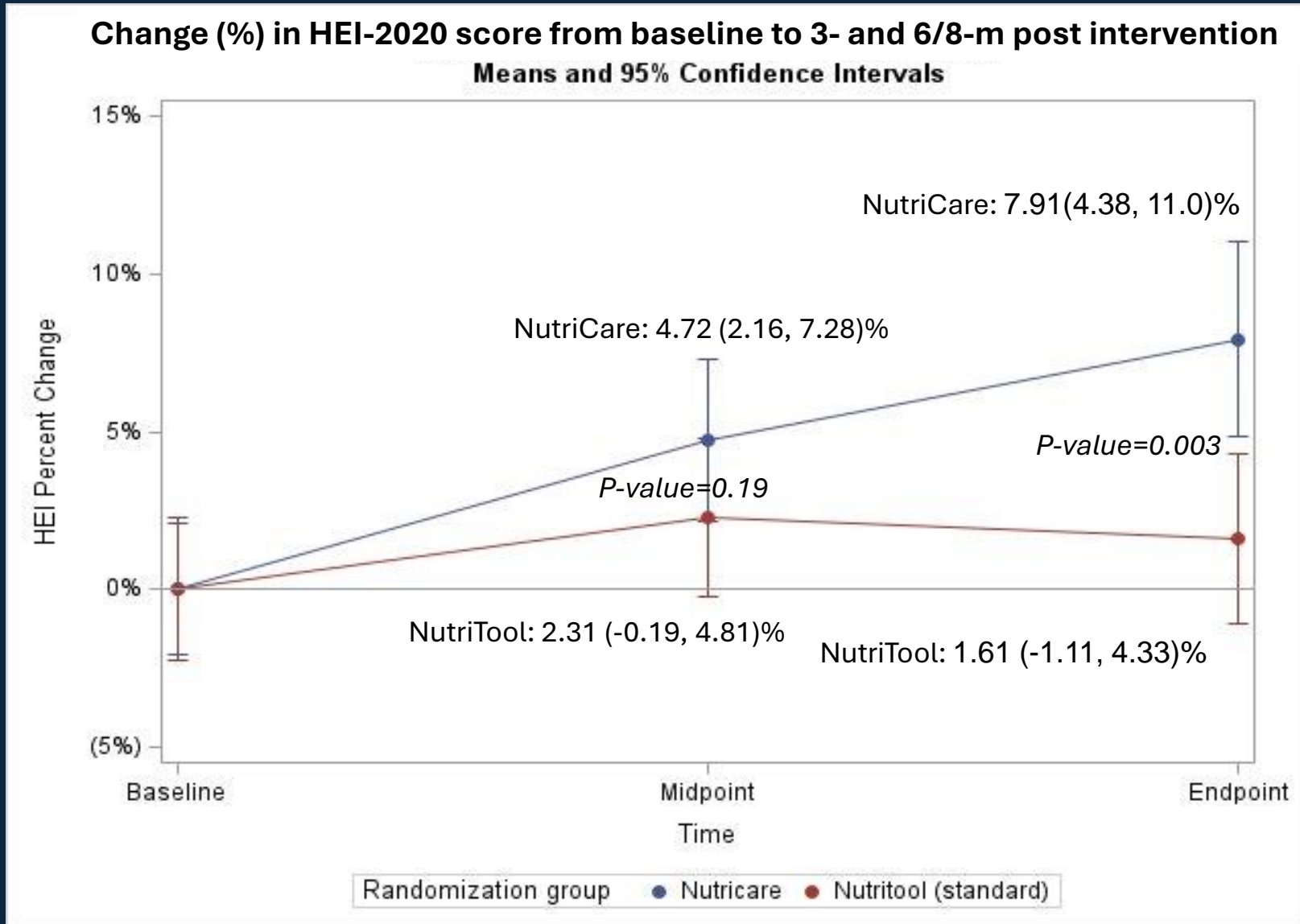
250 patients with lung cancer randomized
(NutriCare=135; NutriTool=115)



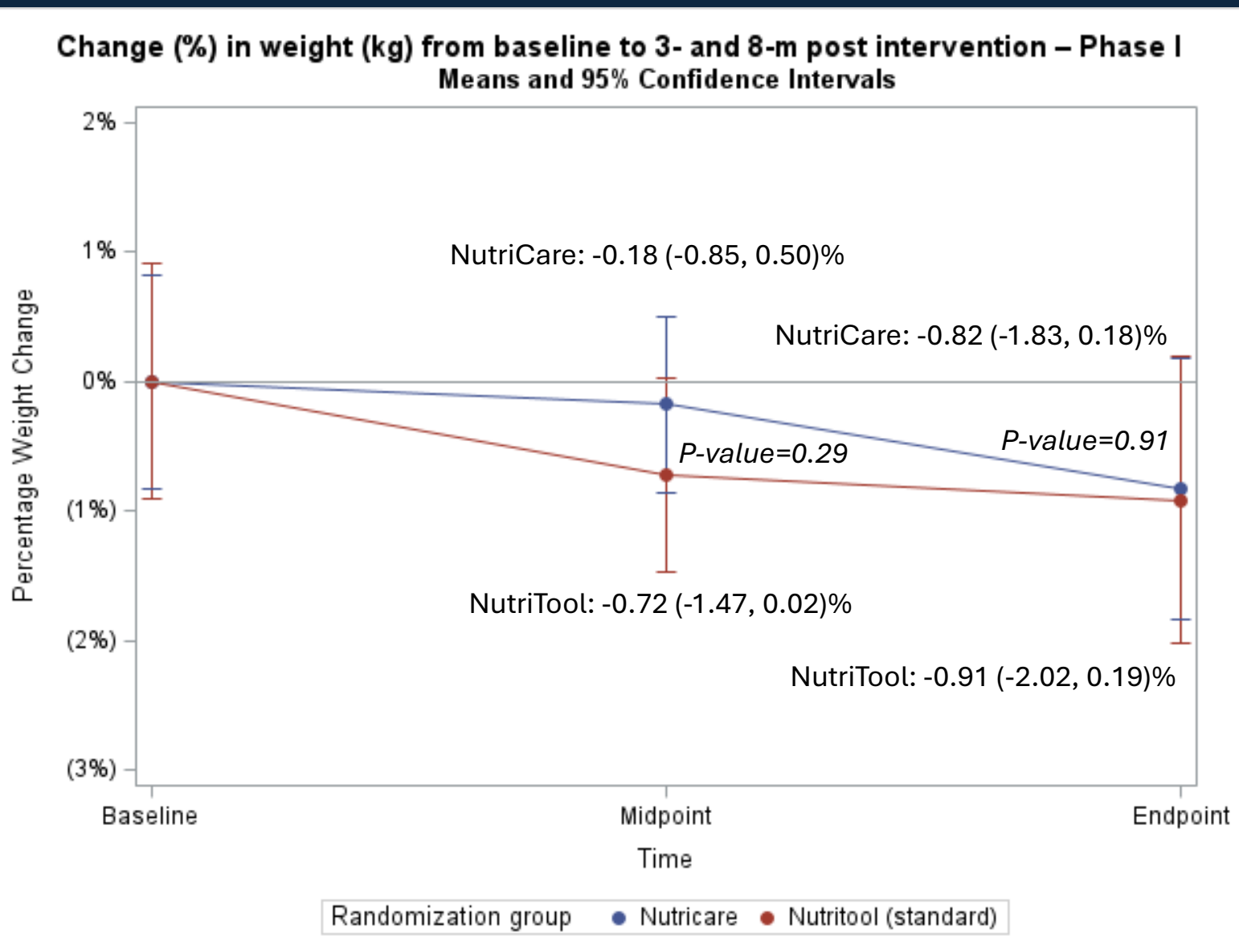
Participant Characteristics

- 83.6% non-small cell lung cancer
- 77.6% late stage
- 68.4% aged 65+ years
- 18.0% racial and ethnic minority groups
- 17.6% low income
- 9.2% no health insurance/Medicaid
- 31.6% residing in rural areas

Preliminary Results – Change in Diet Quality

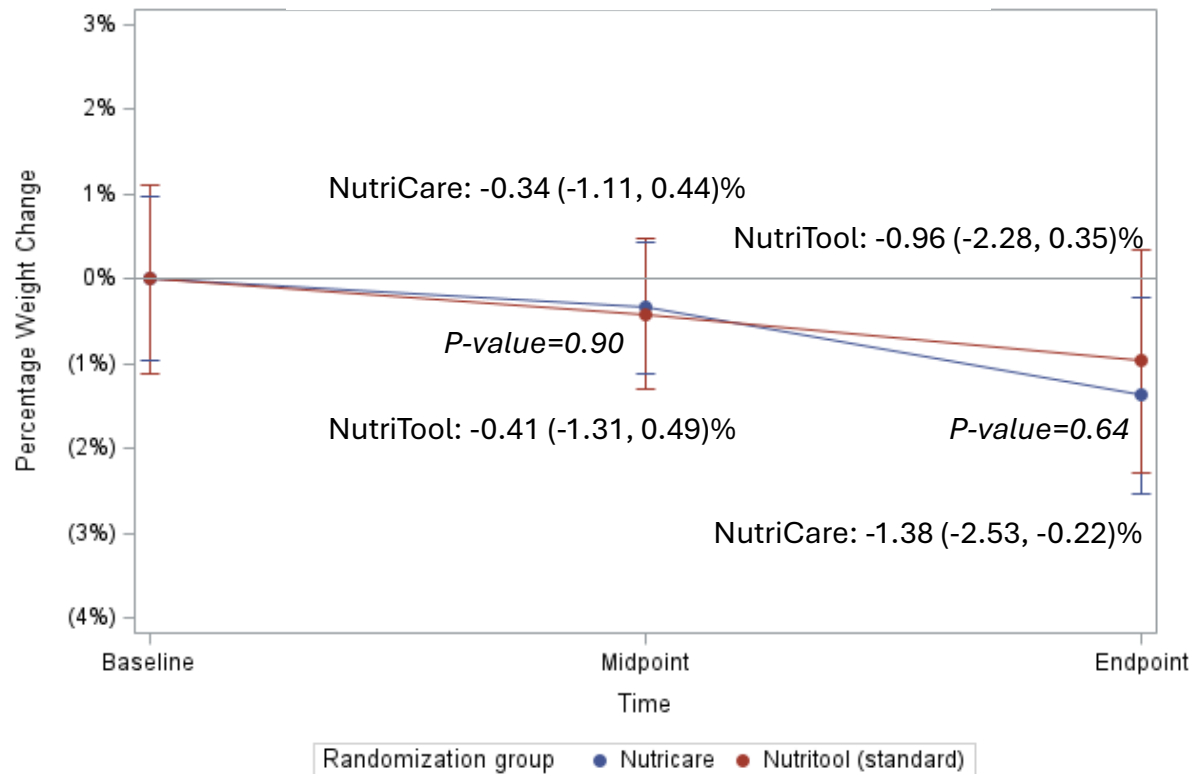


Preliminary Results – Change in Weight (phase I)

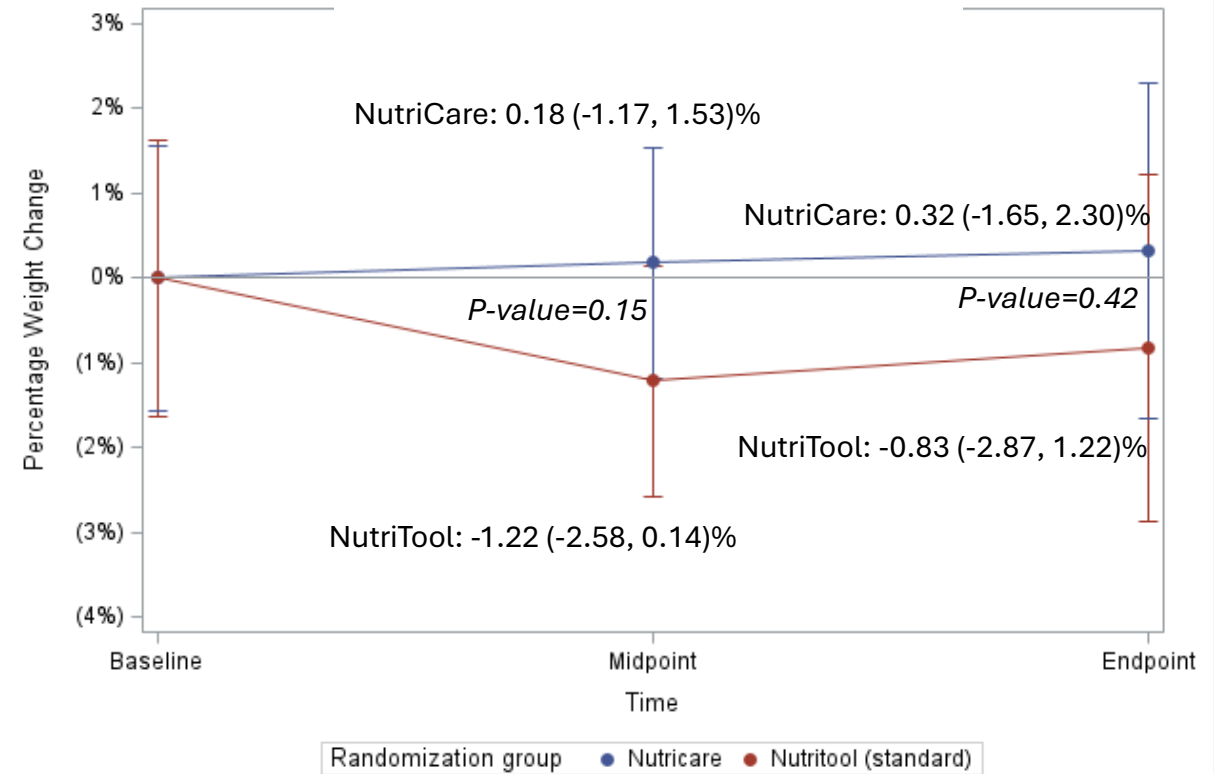


Preliminary Results – Change in Weight by Weight Status (BMI < vs. ≥ 25 kg/m²) at Baseline

Change (%) in weight (kg) from baseline to 3- and 8-m post intervention – Phase I
Overweight/Obese at Baseline



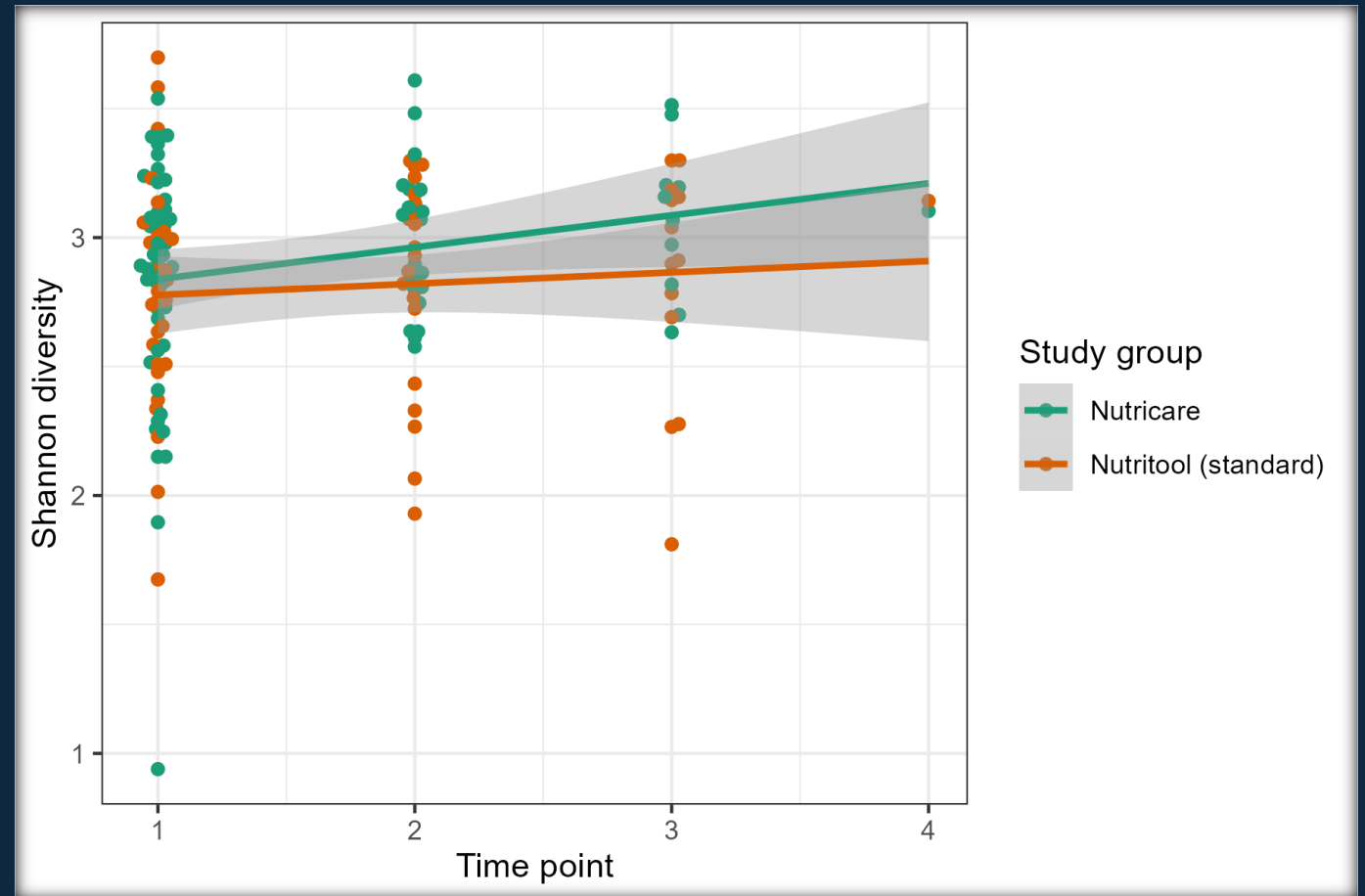
Change (%) in weight (kg) from baseline to 3- and 8-m post intervention – Phase I
Healthy Weight at Baseline



Preliminary Results – Gut Microbiome (phase I)

Increase in diversity over time

- Shannon Diversity (H') Calculation:
 - p_i is the fraction of species i
 - R is the total number of species
- Higher gut microbiome diversity is associated with health in many contexts, including cancer treatment response (e.g., *Gopalakrishnan et al Science 2018*).



SAVE THE DATE!

Food is Medicine in Oncology Care Symposium December 5th, 2024



CENTER *for* HEALTH LAW
and POLICY INNOVATION
HARVARD LAW SCHOOL



NATIONAL
CANCER
INSTITUTE



United States
Department of
Agriculture

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