NUTRITION IN MEDICINE

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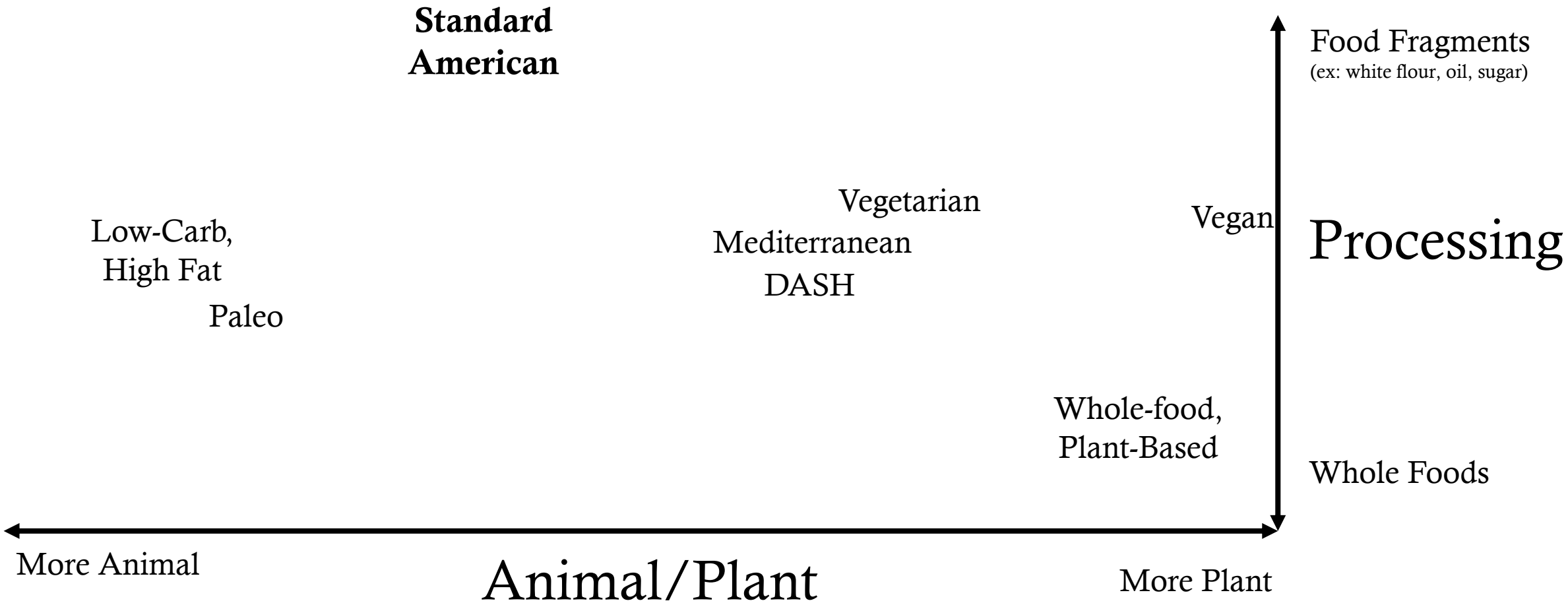
DISCLOSURES

- Royalties from general interest books about plant-based nutrition
- Research funding from Highland Hospital Foundation, with philanthropic donations from T. Colin Campbell Center for Nutrition Studies, the Ladybug Foundation, and multiple individuals

CASE

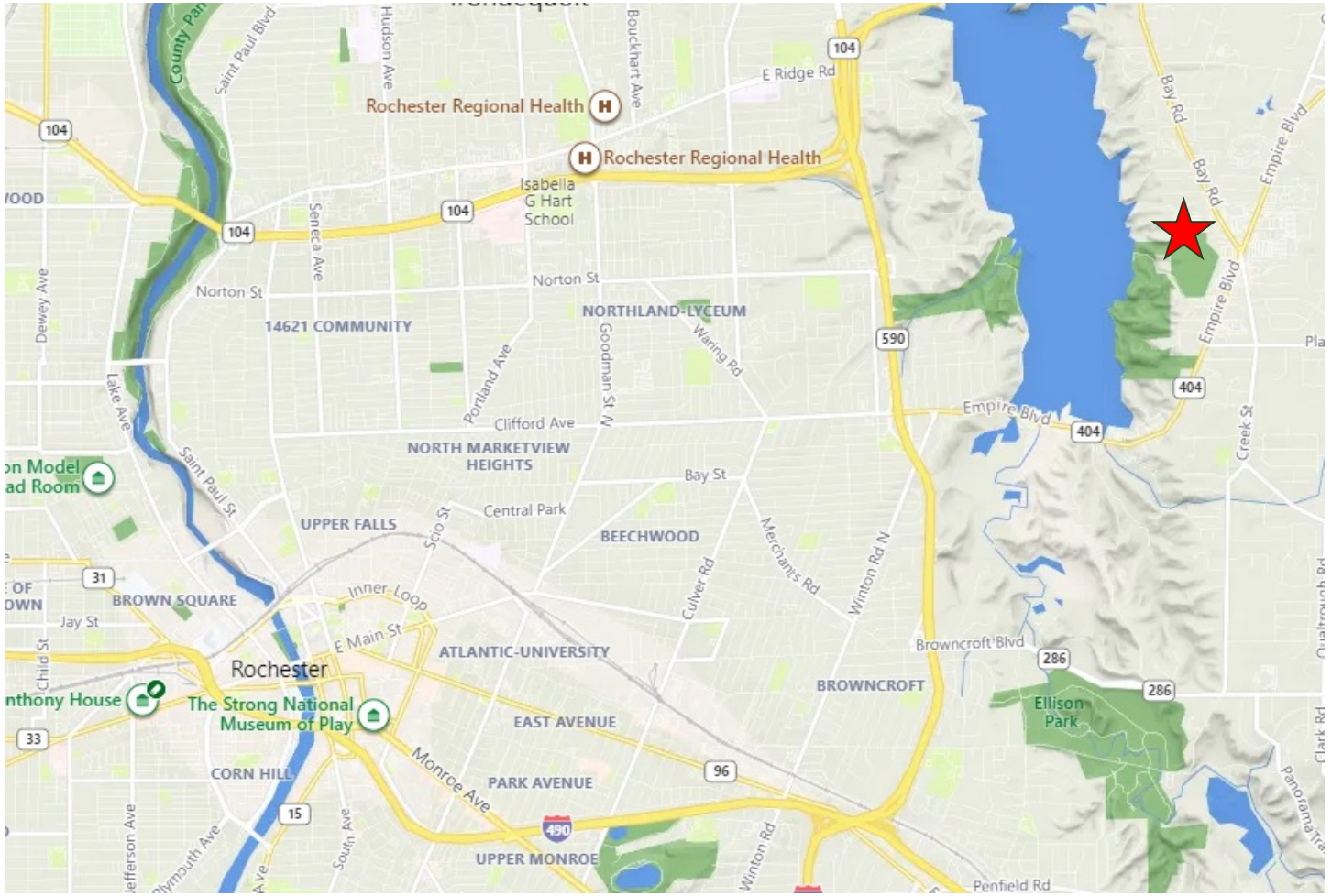
- 72-year old female patient with well controlled diabetes, hyperlipidemia, obesity, and worsening knee OA (starting to mildly limit her physical activity)
- Her slightly older sister was recently diagnosed with breast cancer and she is interested in lowering her cancer risks as much as possible, losing weight, and getting healthier to better enjoy time with her family and to maintain mobility and energy. Motivation is sky high.

DIETARY SPECTRUM



LOCATION


UR | HIGHLAND
MEDICINE | HOSPITAL
Nutrition in Medicine Research Center


Rochester Regional Health
Rochester Regional Health
Isabella G Hart School
14621 COMMUNITY
NORTHLAND-LYCEUM
NORTH MARKETVIEW HEIGHTS
UPPER FALLS
BEECHWOOD
BROWN SQUARE
ATLANTIC-UNIVERSITY
Rochester
The Strong National Museum of Play
EAST AVENUE
CORN HILL
PARK AVENUE
UPPER MONROE
BROWNCROFT
Ellison Park
Norton St
Clifford Ave
Bay St
Central Park
E Main St
Inner Loop
Jay St
Monroe Ave
Empire Blvd
Browncroft Blvd
E Ridge Rd
Penfield Rd
104
31
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1205 Bay Road
UR MEDICINE | HIGHLAND HOSPITAL
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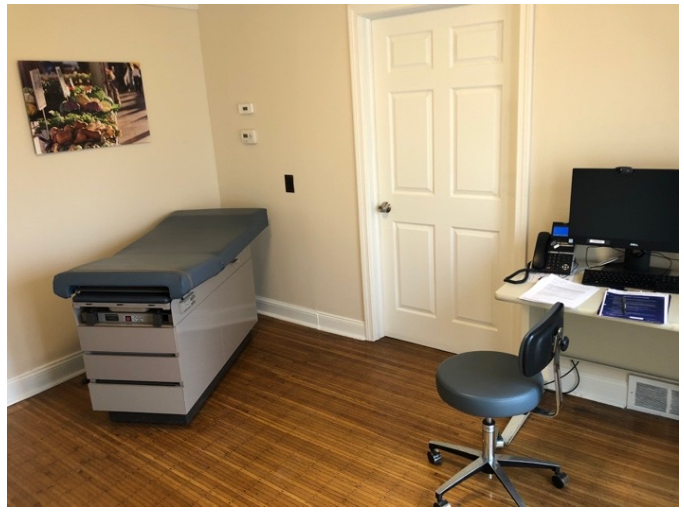
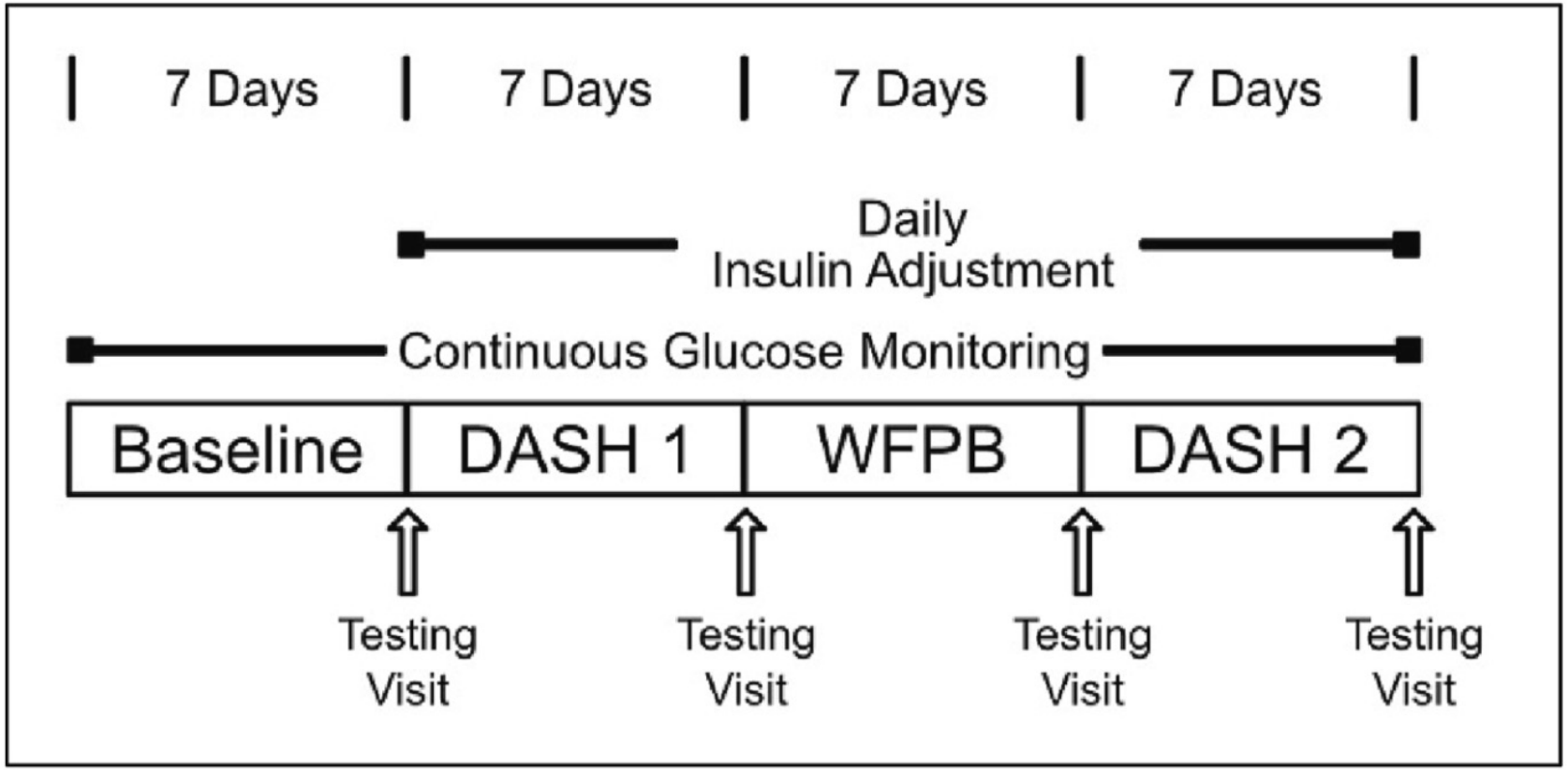
You must



STAFF

TWO PLANT-BASED DIETS IN TYPE 2 DIABETES

Campbell TM, Campbell EK, Attia J, et al. The Acute Effects of a DASH diet and Whole Food, Plant-Based diet on Insulin Requirements and Related Cardiometabolic Markers in Individuals with Insulin-Treated Type 2 Diabetes. *Diabetes Res Clin Pract.* 2023:110814.



BASELINE CHARACTERISTICS (n=15)

Age	56.7 Years
BMI	34.3 Kg/M^2
Years Since Diabetes Diagnosis	12 Years
HbA1c	8.4 %
Basal Insulin	100 %
Prandial Insulin	80 %
Total Daily Insulin Dose	91 Units

Breakfast:

Steel cut oatmeal with fruit salad, walnuts, flax seed

Lunch:

Turkey sandwich on whole wheat with lettuce, tomato, onion, mustard, and mayo

Side Salad

Dinner:

Blackened Salmon

Farro salad with spinach, cucumber, tomato, asparagus

Snacks:

Mozzarella stick

Whole wheat crackers

Yogurt parfait

Walnuts

DASH MENU (DAY 1) – 1800 CALORIES

WFPB MENU (DAY 1) – 1800 CALORIES

Breakfast:

2 Banana Flax Muffins with fruit

Lunch:

Sweet Potato Enchiladas

Side Salad

Dinner:

Mediterranean White Bean Soup

Side Salad

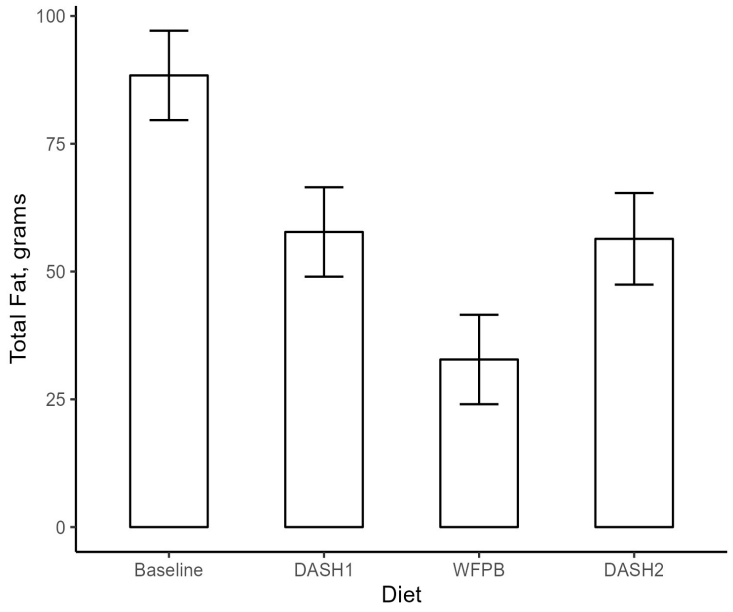
Snacks:

Whole grain crackers (Mary's Gone Crackers)

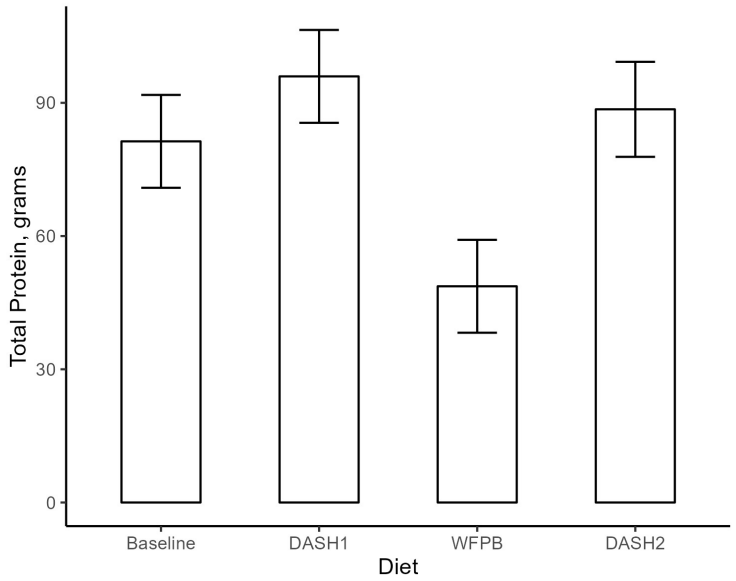
Hummus

Fresh Pineapple Chunks

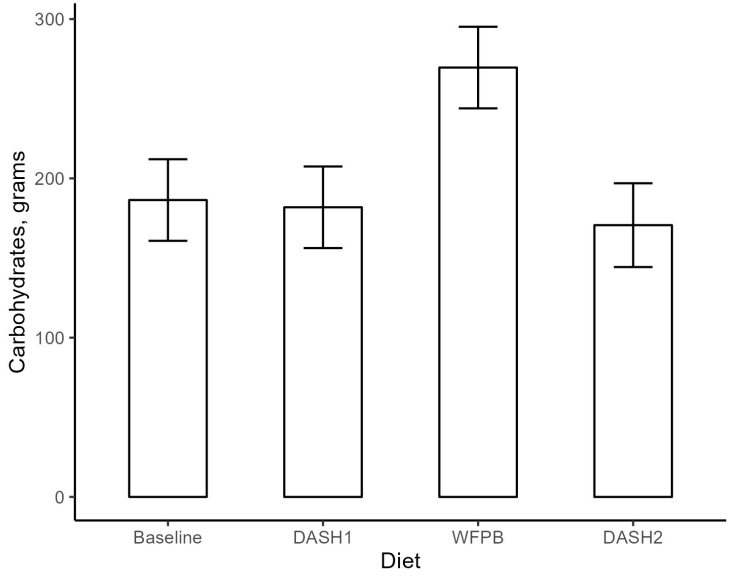
Fat



Protein



Carbohydrate



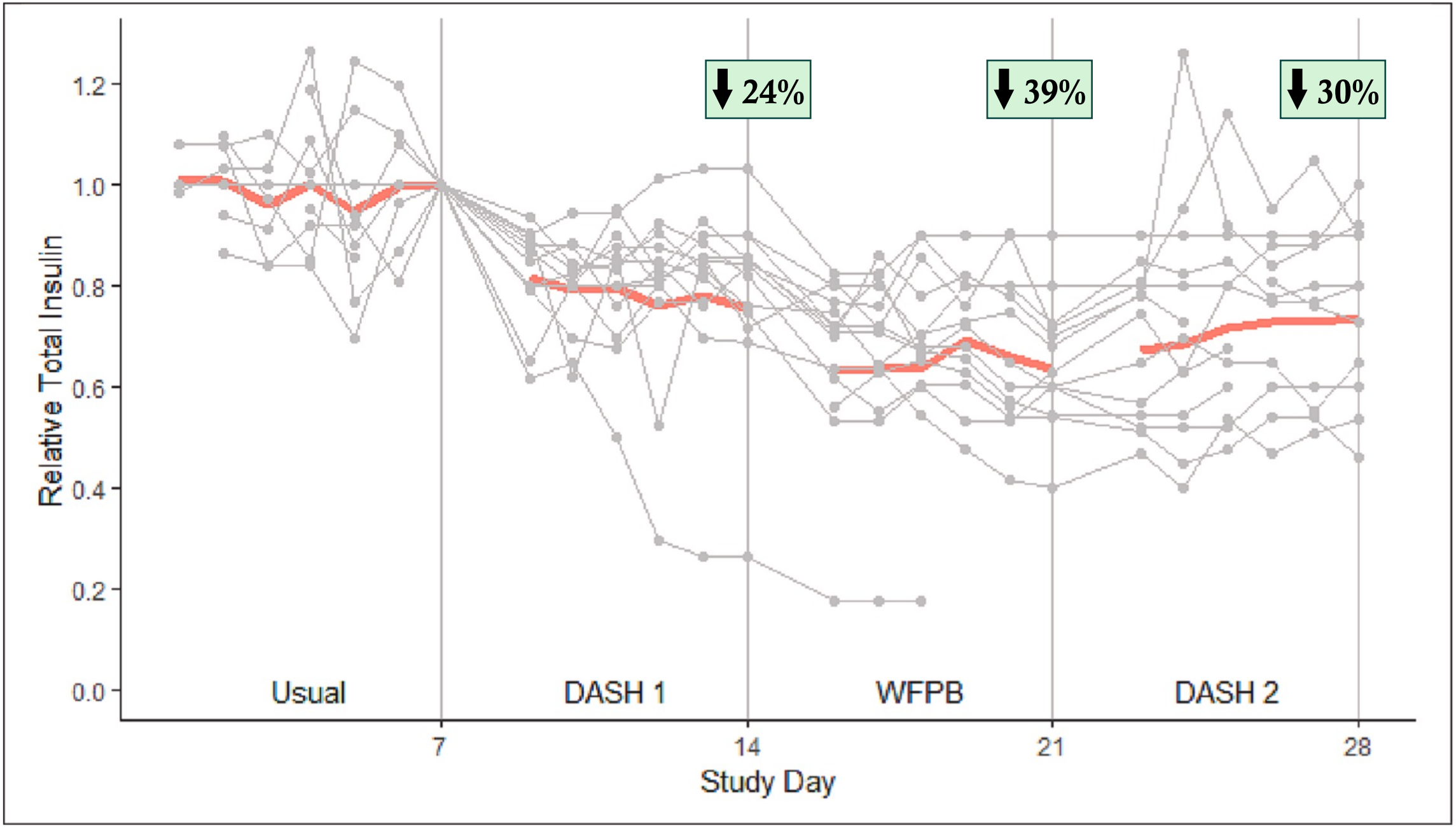
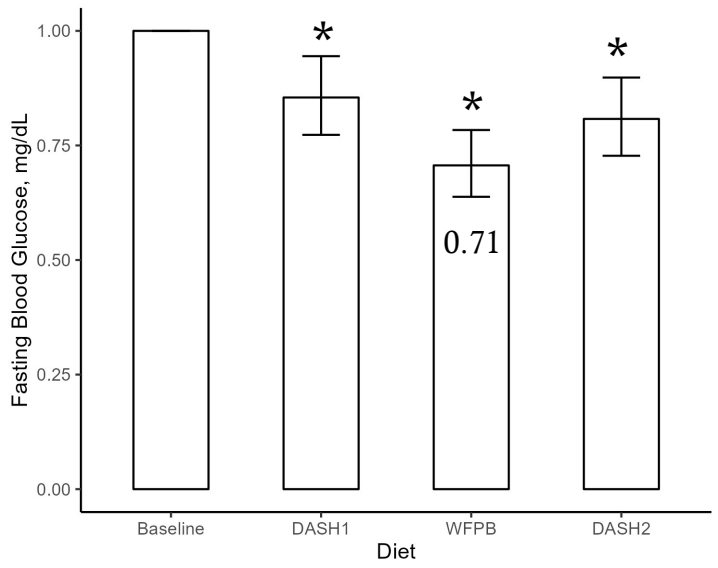


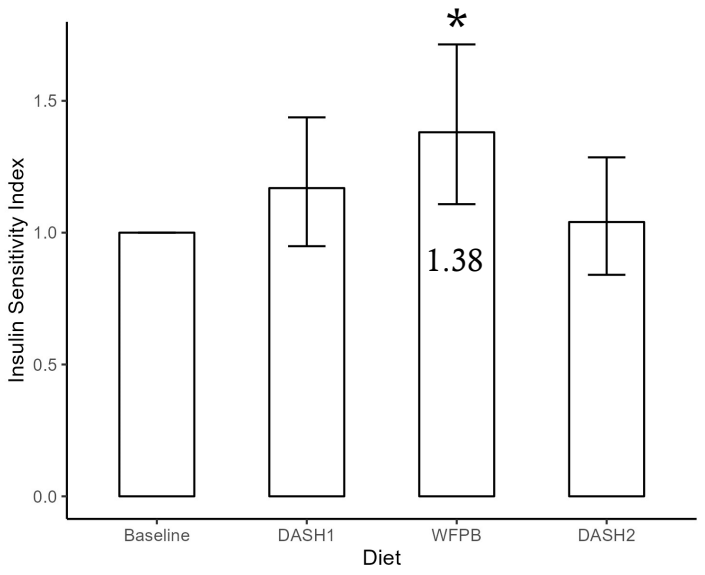
Fig. 4. Relative Daily Insulin Usage During Four Study Phases. Bold line denotes the geometric mean total daily insulin usage relative to the insulin dose at the end of the baseline week. Light gray lines with circles are trajectories of each individual participant. 1st day of each diet is omitted due to non-dietary influence of

INSULIN SENSITIVITY

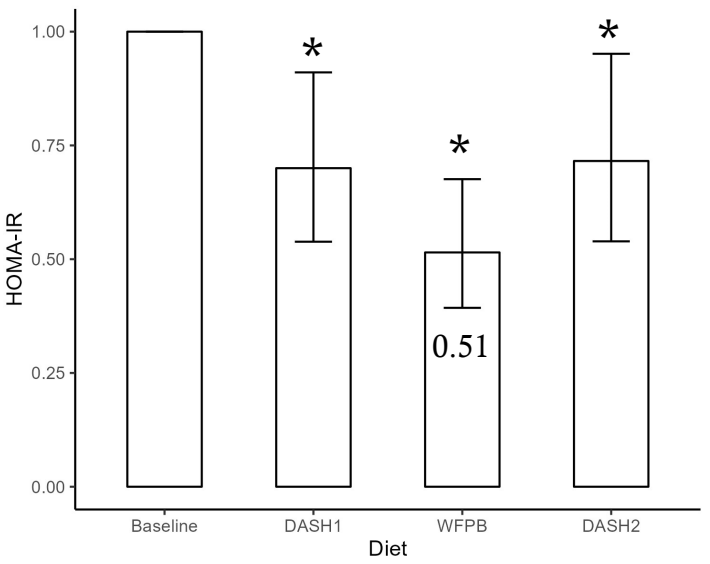
FASTING BLOOD GLUCOSE



INSULIN SENSITIVITY INDEX



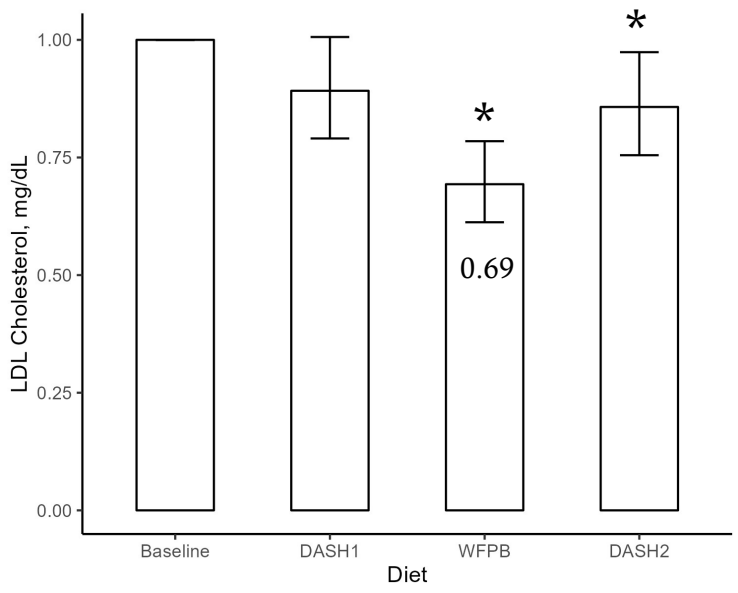
HOMA IR



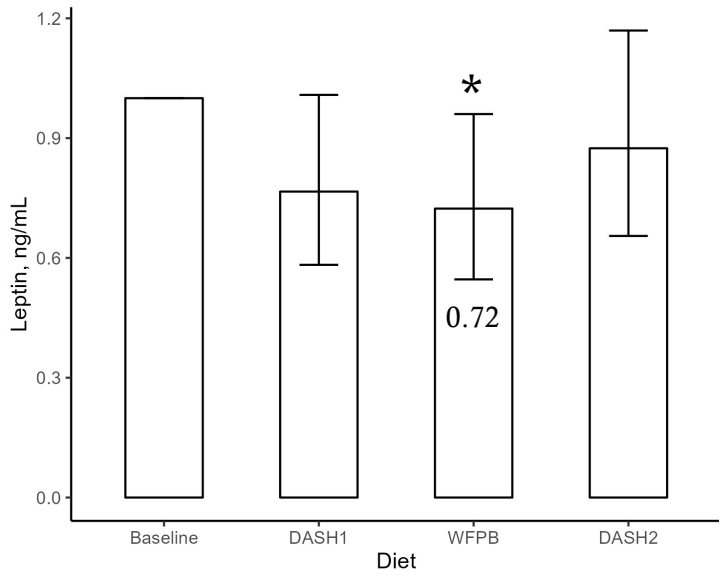
* $p<0.05$ compared to baseline

OTHER CARDIOMETABOLIC

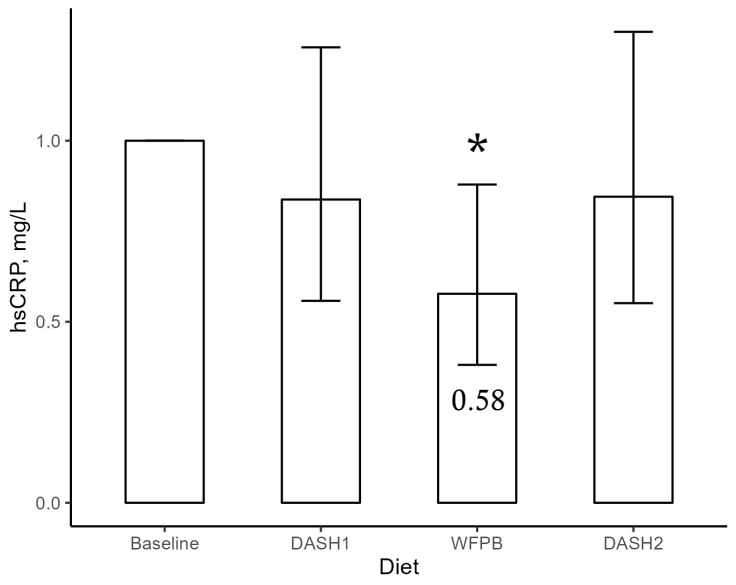
LDL CHOLESTEROL



LEPTIN

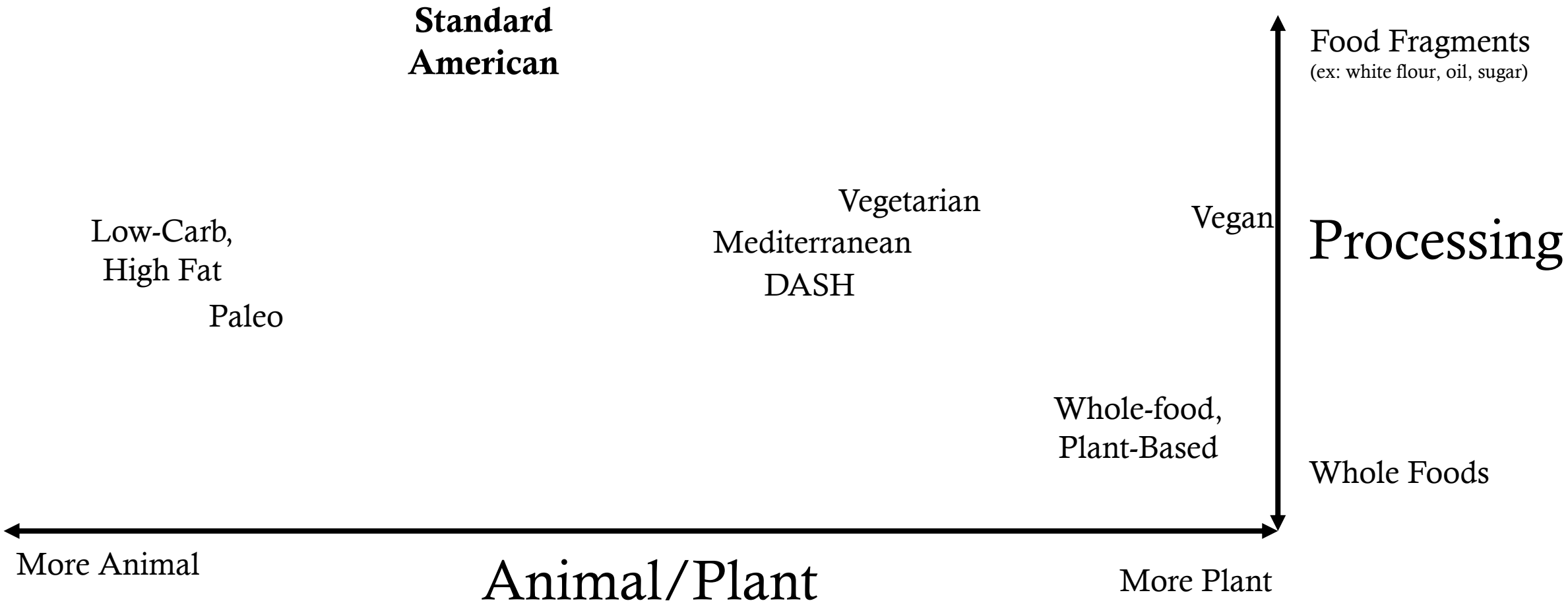


hsCRP



* $p<0.05$ when compared to baseline

DIETARY SPECTRUM



NOT JUST METABOLIC DISEASE…
…METASTATIC BREAST CANCER

Intervention

Dietary Intervention

Mediators

Obesity & Treatment-Related Weight Gain

Cardiometabolic & Hormonal Risk Factors:

- Insulin
- Insulin Resistance
- Blood Glucose
- Sex Hormones
- Serum Cholesterol
- IGF-1

Goals of Care

- ↓ Breast Cancer Progression
- ↓ Mortality
- ↑ Quality of Life

WHOLE-FOOD, PLANT-BASED NUTRITION AMONG WOMEN WITH METASTATIC BREAST CANCER: A PILOT STUDY OF RECRUITMENT, RETENTION, AND PRELIMINARY CHANGES IN BIOMARKERS AND SYMPTOMS

Co-Investigators/Collaborators:

- Erin Campbell, MD (Public Health Sciences)
- Luke Peppone, PhD (Cancer Control)
- Eva Culakova, PhD (Cancer Control)
- James Fetten, MD (Oncology)
- Richard Moore (Gyn Onc)
- Alissa Huston, MD (Oncology)
- Michelle Shayne, MD (Oncology)

INTERVENTION

- 8 weeks of a whole-food, plant-based diet with meals provided.
- Subjects were encouraged to eat as much as necessary to be full, and could add their own food in place of, or in addition to, provided food.
- Weekly visits with TC and/or EC
- Daily Multivitamin
- Testing at weeks 0, 4, 8

CONTROL

- Daily multivitamin
- Continue usual diet
- 2 weeks of food/education provided after all testing was complete as an incentive to continue participating.

SAMPLE MEALS

Breakfast: Muesli with ground flaxseed and fresh berries with unsweetened, non-dairy milk

Lunch: Ocean Chickpea Sandwich with Baked Sweet Potato Fries

Dinner: Mushroom Stew with Roasted Green Beans & Onions, Southern Kale

Breakfast: Banana Flax Muffin with 1 1/3 cup fresh fruit

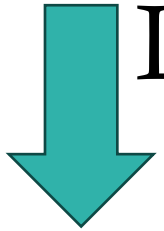
Lunch: Vegetable Barley Soup with Whole Grain Bread

Dinner: Peanut Soba Noodles with Roasted Broccoli & Cauliflower

BASELINE CHARACTERISTICS

Characteristics	Mean ± SD	Control (n=10*)	Intervention (n=21)
Age (years)		64.2 ± 8.9	59.1 ± 11.0
Race	Black, n (%)	0 (0)	1 (4.8)
	White, n (%)	10 (100.0)	19 (90.5)
	No answer, n (%)	0 (0)	1 (4.8)
Ethnicity	Not Hispanic/Latino, n (%)	10 (100.0)	20 (95.2)
	No answer, n (%)	0 (0)	1 (4.8)
BMI at Study Baseline (kg/m^2)	Mean ± SD	28.4 ± 4.4	30.2 ± 7.2
Age at First Breast Cancer Diagnosis (years)	Mean ± SD	52.9 ± 11.7	49.4 ± 10.9
Years Elapsed Since First Diagnosis	Mean ± SD	11.2 ± 7.9	9.7 ± 6.4
Years Elapsed Since Diagnosis of Metastatic Breast Cancer	Mean ± SD	5.3 ± 6.0	2.2 ± 1.8
Hormone Receptor Status	ER+, n (%)	10 (100.0)	20 (95.2)
	PR+, n (%)	9 (90.0)	17 (81.0)
	HER2+, n (%)	3 (30.0)	6 (28.6)
Location of Metastases	Bone, n (%)	7 (70.0)	19 (90.5)
	Lung, n (%)	4 (40.0)	8 (38.1)
	Brain, n (%)	1 (10.0)	3 (14.3)
	Liver, n (%)	2 (20.0)	1 (4.8)
	Other, n (%)	6 (60.0)	7 (33.3)

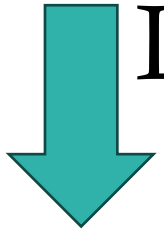
WEIGHT (STARTING BMI 29.7)



Lost 1-2 pounds/week
(177.5 to 165.7lb)

BREAST CANCER & WEIGHT

WEIGHT (STARTING BMI 29.7)



Lost 1-2 pounds/week
(177.5 to 165.7lb)

CARDIOMETABOLIC

Within Group

LDL Cholesterol	↓ 21% (p<0.01)
Insulin (fasting)	↓ 33% (p<0.01)
HOMA-IR	↓ 39% (p=0.01)
IGF-1	↓ 10% (p=0.01)
Sex Hormone Binding Globulin	↑ 32% (p<0.01)
Free Testosterone	↓ 35% (p=0.08)

Campbell TM, Campbell EK, Culakova E, et al. A Whole-Food, Plant-Based Randomized Controlled Trial in Metastatic Breast Cancer: Weight, Cardiometabolic, and Hormonal Outcome. *Breast Cancer Research and Treatment.* 2024.

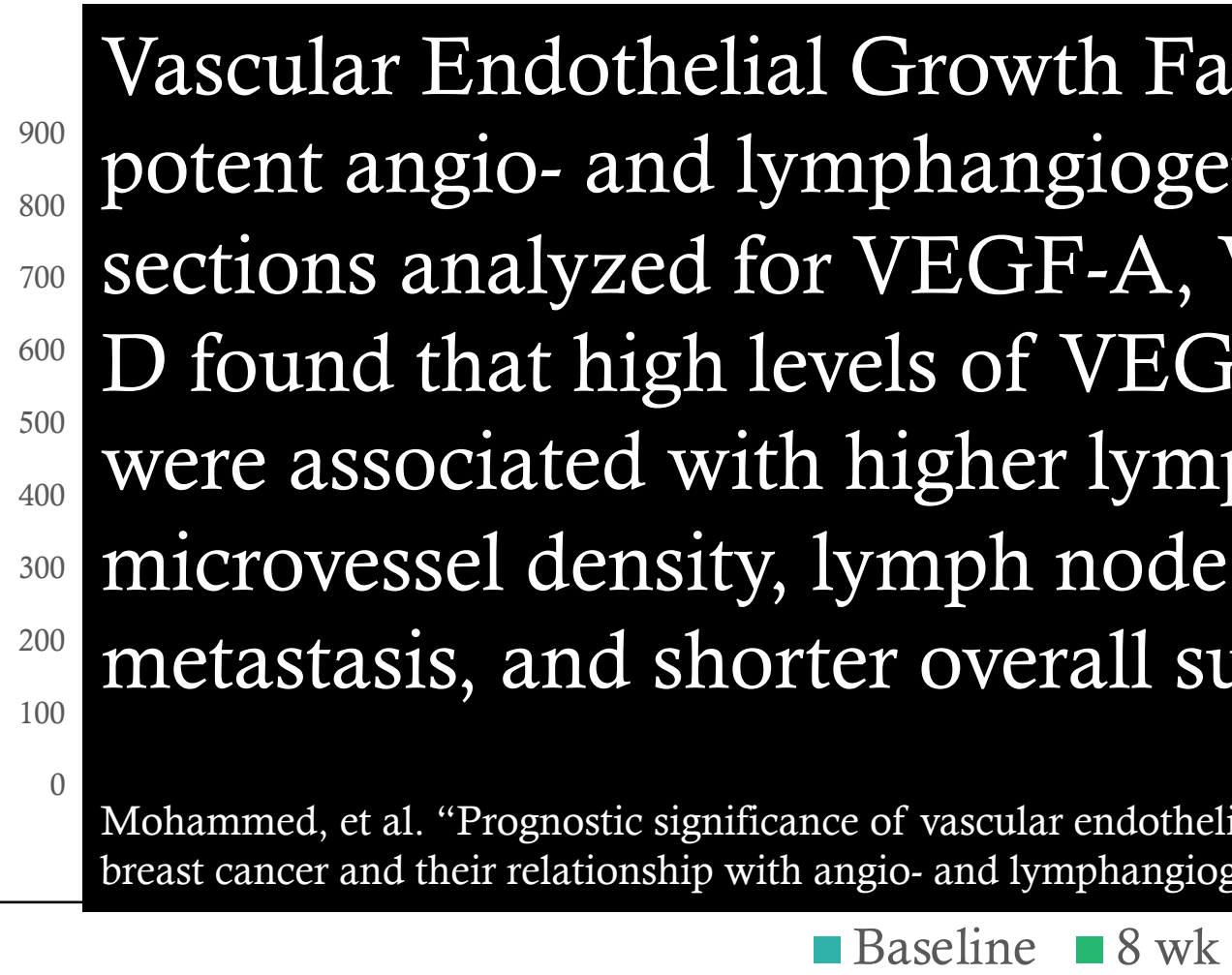
CANCER MARKERS: STABLE IN INTERVENTION GROUP INCREASED IN CONTROL GROUP (NS)

Outcome	Intervention vs Control at week 8 (adjusted for baseline)	
	Diff.	p-value
CA 27.29 (U/mL)[c]	-5.3	0.23
CA 15-3 (U/mL)[c]	-5.2	0.53
CEA3 (ng/mL)	-0.5	0.54

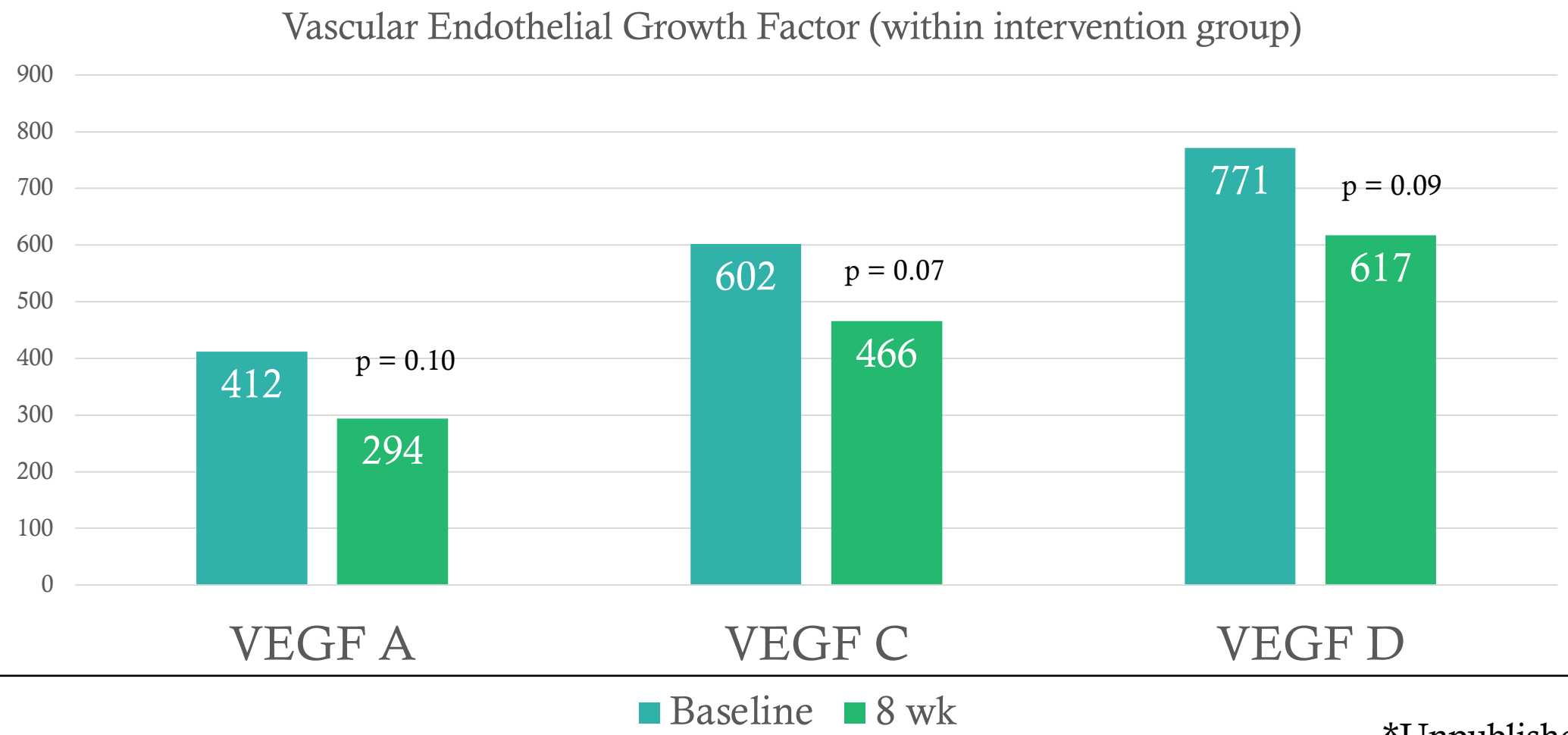
SECONDARY ANALYSES

Vascular Endothelial Growth Factor (VEGF) has potent angio- and lymphangiogenic functions. Tumor sections analyzed for VEGF-A, VEGF-C, and VEGF-D found that high levels of VEGF-A and VEGF-C were associated with higher lymph vessel density, microvessel density, lymph node metastasis, distant metastasis, and shorter overall survival.

Mohammed, et al. "Prognostic significance of vascular endothelial cell growth factors –A, -C, and –D in breast cancer and their relationship with angio- and lymphangiogenesis." *British Journal of Cancer. 2007*



SECONDARY ANALYSES



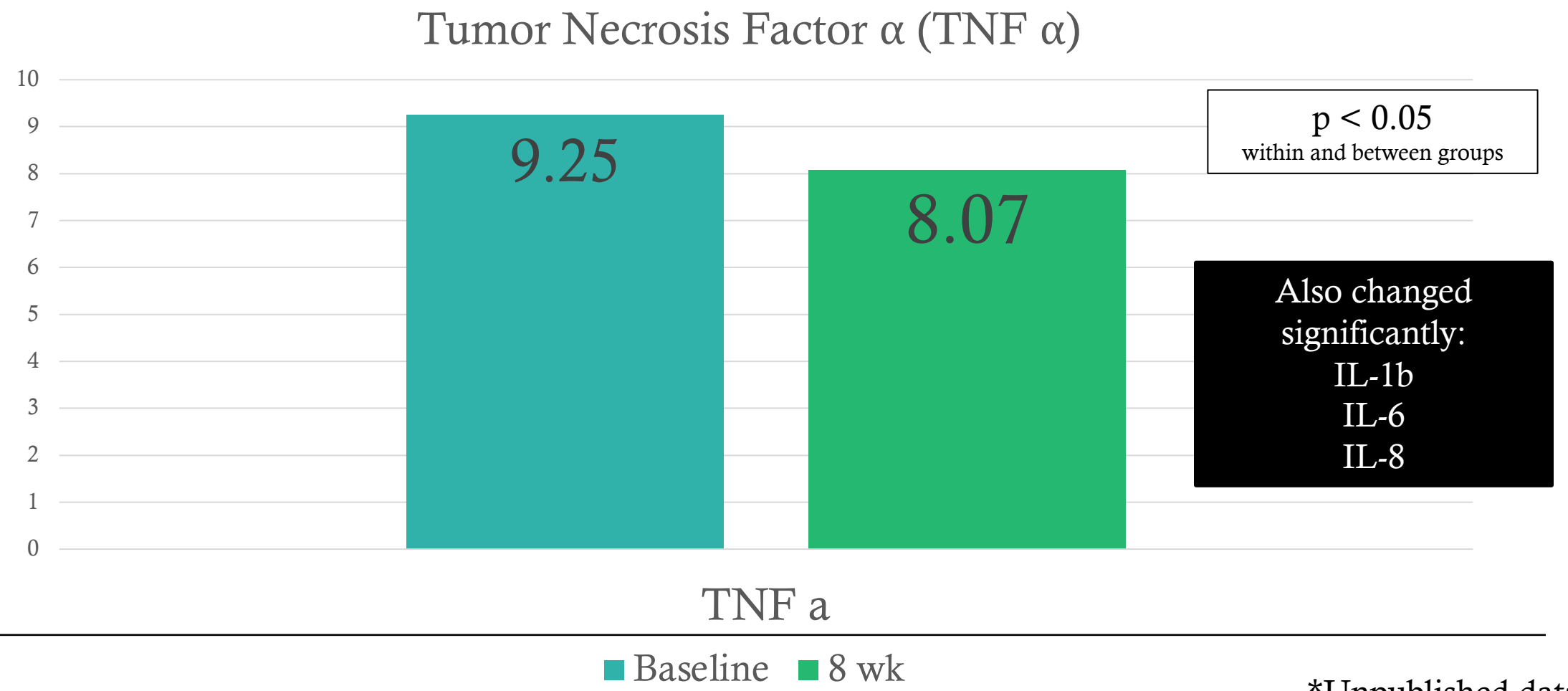
*Unpublished data

SECONDARY ANALYSES

Tumor necrosis factor α (TNFα) is a pro-inflammatory cytokine (signaling molecules that control inflammation) whose expression is increased in a variety of cancers. In particular, in breast cancer it correlates with augmented tumor cell proliferation, higher malignancy grade, increased occurrence of metastasis and general poor prognosis for the patient.

Florenxia Mecogliano, et al. “Tumor Necrosis Factor α Blockade: An Opportunity to Tackle Breast Cancer.” *Frontiers in Oncology. 2020*

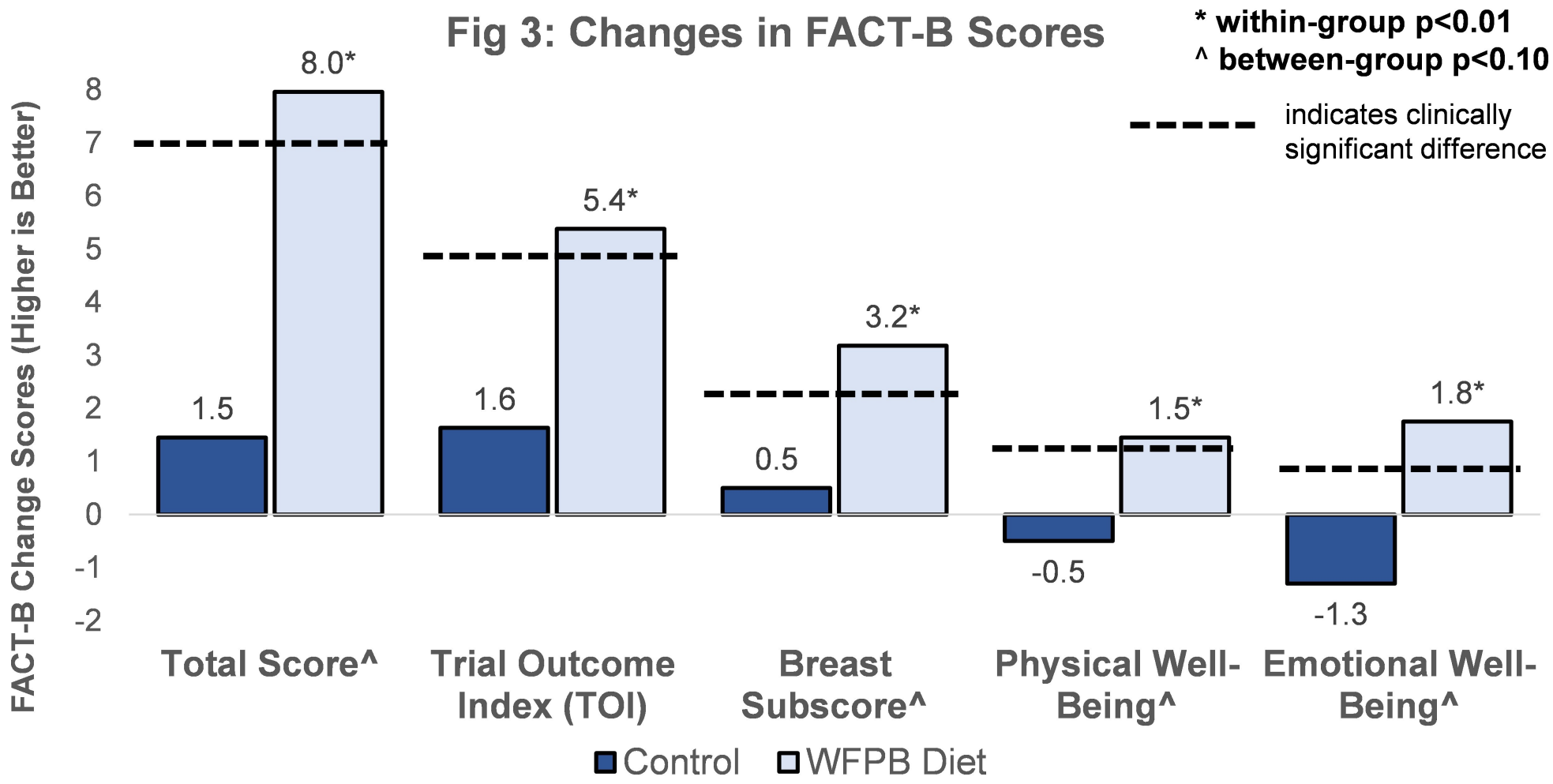
SECONDARY ANALYSES



*Unpublished data

OVERALL QUALITY OF LIFE

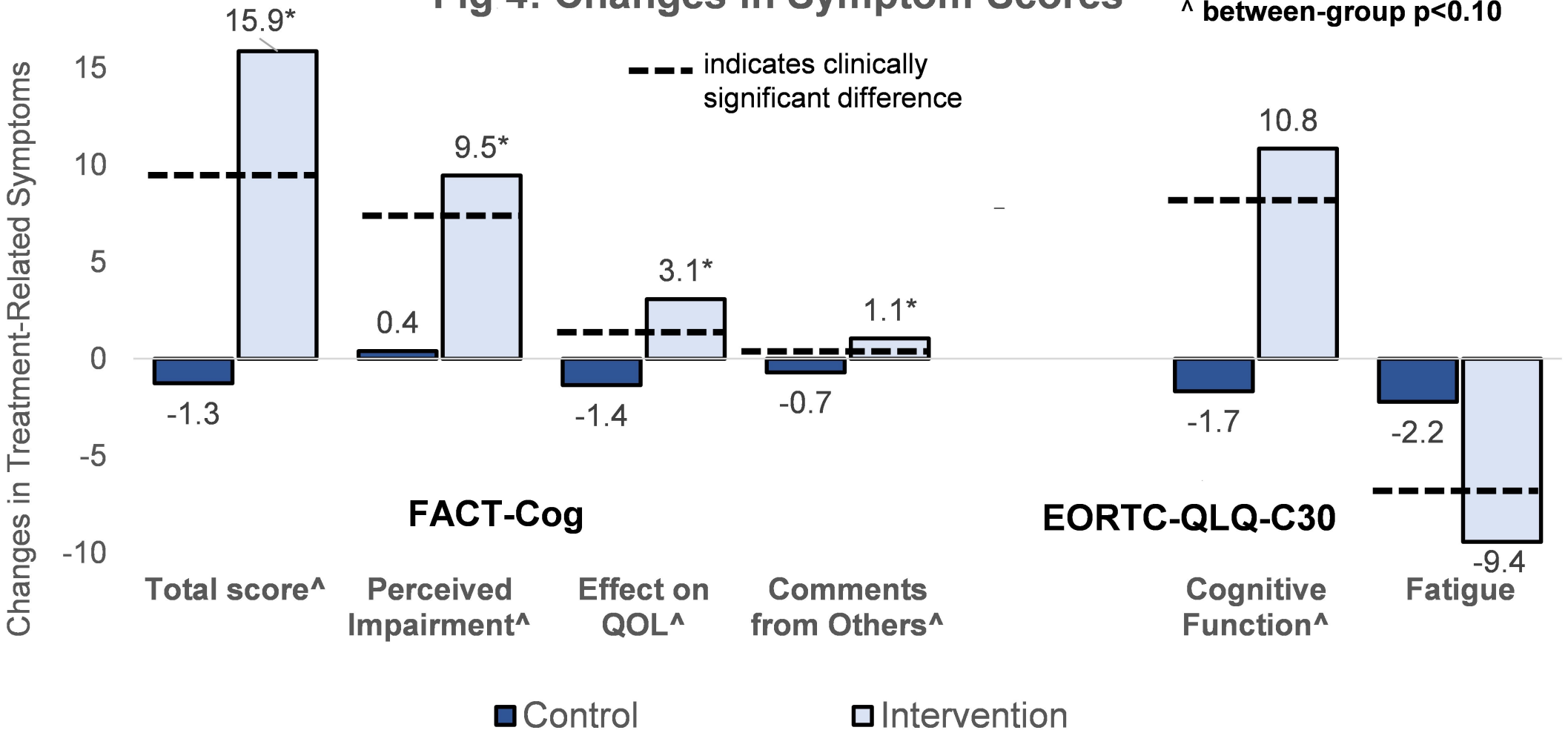
Campbell EK, Campbell TM, Culakova E, et al. A Whole Food, Plant-Based Randomized Controlled Trial in Metastatic Breast Cancer: Feasibility, Nutrient, and Patient-Reported Outcomes. *Breast Cancer Research and Treatment.* 2024.



PERCEIVED COGNITIVE FUNCTION AND FATIGUE

Fig 4: Changes in Symptom Scores

*** within-group p<0.01**
^ between-group p<0.10



FEASIBILITY

95% of intervention subjects were compliant with the diet
94.3% of all recorded calorie intake (from all intervention subjects) was ‘on-plan’
100% completed all 3 testing visits
Minimal adverse events

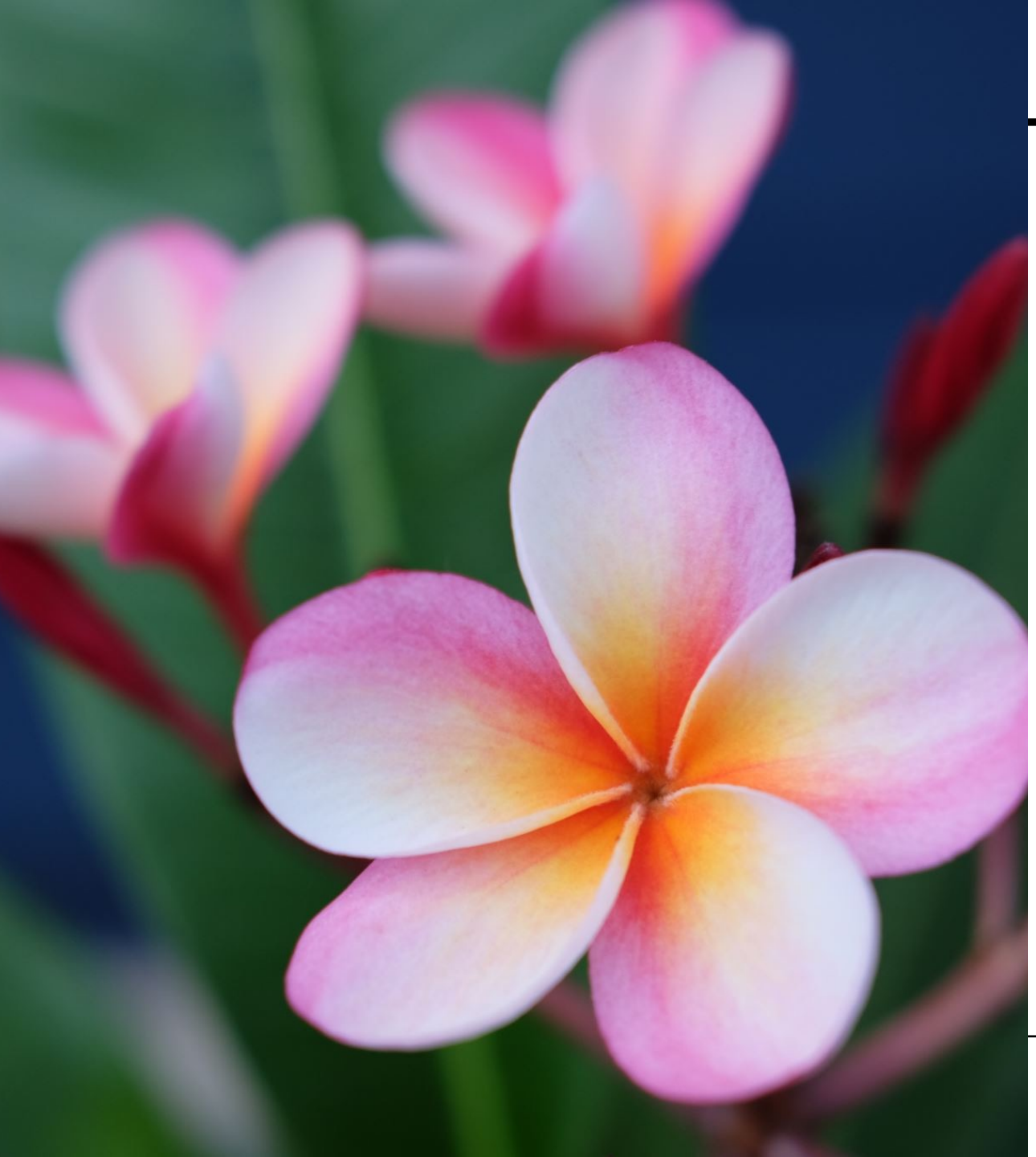
DIETARY INTAKE (94% OF FOODS RECORDED WERE 'ON-PLAN')

Nutrient Intake of the Intervention Group		
	Week 8 Final	Percent Change
Total weight (g)	3192.5	⇧ 16.0%
Energy (kcal)	1321	⇩ 25.9%
Fat (% of total kcal)	20.4	⇩ 43.0%
Carbohydrate (% of total kcal)	66.2	⇧ 36.8%
Protein (% of total kcal)	12.6	⇩ 13.7%
Dietary Fiber (g/1000 kcal)	30.8	⇧ 242.5%

FEASIBILITY

- "On a scale from 1 to 10, how strongly would you recommend that other cancer patients be given this type of nutrition and support intervention if they were able and willing to participate?" (1 = "Would not recommend; 10 = "Highly recommend")

Avg response: 9.5



Do you feel that your health has benefited from the study intervention?

19 of 19 respondents:

Yes

RELATED TO REAL WORLD FEASIBILITY…
…WHAT ABOUT FOOD COST?

Previous research

Public perception

Our experience

ANALYSIS OF T2DM STUDY FOOD RECORDS

3-day food records

Retailer prices

Analysis

RESULTS

Mean Daily Food Costs by Dietary Phase			
	Baseline (n=14)	DASH (n=26)	WFPB (n=14)
US Dollar ($)/day as consumed	$15.72	$12.74*	$9.78*
US Dollar ($)/day adjusted to 1800 kcal/day	$15.69	$14.92	$11.96*

*$p<0.05$ when compared to baseline

RESULTS

Mean Daily Approximated *Ingredient Only* Food Costs by Dietary Phase			
	Baseline (n=14)	DASH (n=26)	WFPB (n=14)
US Dollar ($)/day as consumed	$11.01	$11.81	$8.83*
US Dollar ($)/day adjusted to 1800 kcal/day	$10.84	$13.72*	$10.67

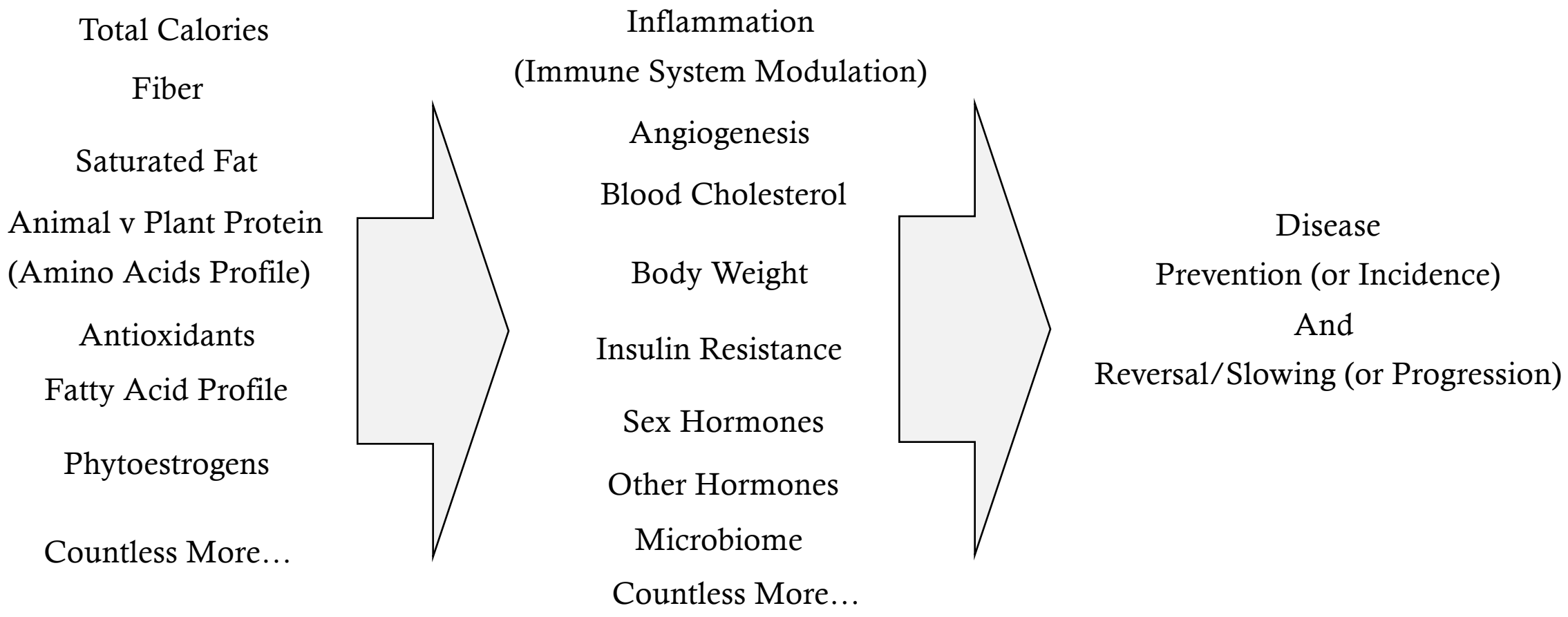
*p<0.05 when compared to baseline

LIMITATIONS
(AKA EDUCATION AND ADVOCACY OPPORTUNITIES)

Time and skills

Access

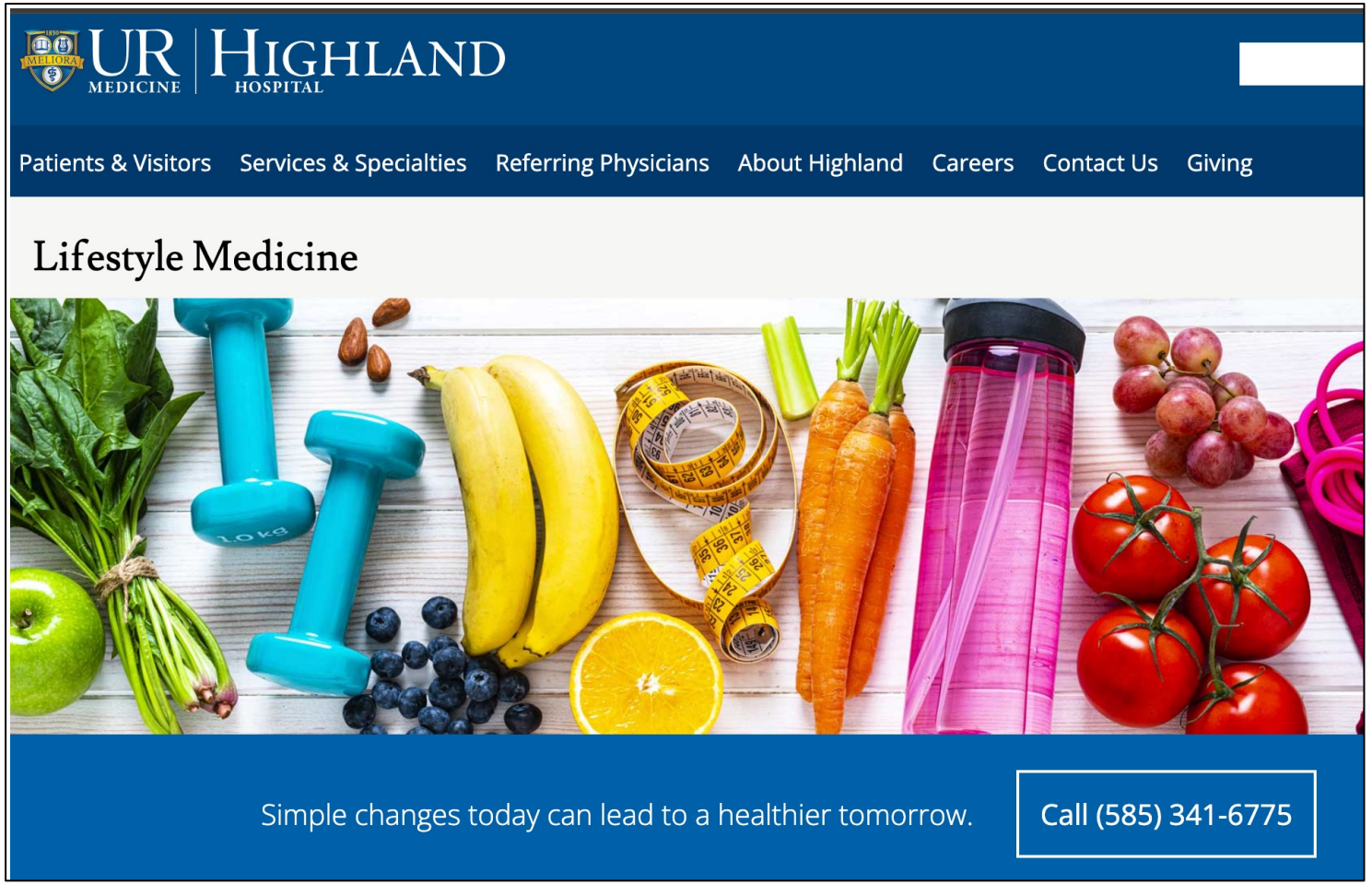
Long-term patterns



NUTRITION: NETWORK IN…. NETWORK OUT

RESOURCES

- Lifestyle Medicine Clinic
- Meals from our research kitchen (coming soon!)
  - NutritionInMedicineRocs.org



THANK YOU

- **Coinvestigators**: Luke Peppone, PhD, Eva Culakova, PhD, Steven Wittlin, MD, Derick Peterson, PhD, Don Harrington, MBA, and many other collaborators/co-investigators across cancer control, oncology, and endocrinology
- **Study 'staff'**: Lisa Blanchard, Kelly Koch, Laurie Taillie, Nellie Wixom
- **Highland Hospital Foundation** and its donors that have supported research to learn about nutrition as medicine.