

Presenter Disclosure Information Elements

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Increased Consumption of Fruits and Vegetables and Weight Change Over Time

FINANCIAL DISCLOSURE:

Eric Rimm has separate unassociated funding jointly with the University of East Anglia to conduct observational and experimental studies of blueberries and CVD health outcomes from the USDA/US Blueberry highbush council.

Increased Consumption of Fruits and Vegetables and Weight Change Over Time

Monica Bertoia, MPH, PhD





Fuji apples
D. 2

White

Red

Green

Yellow

Orange

Avocado

Lemon

Orange

Apple

Apple

Apple

Apple

Apple

APPLES

Objective

To examine the association between increased intake of fruits and vegetables and weight change over time

- Total fruits, total vegetables
- Subtypes
- Individual fruits and vegetables
- High and low fiber
- High and low glycemic load (GL)

Measurement of Diet and Weight

- Weight self-reported every 2 years via questionnaire
- 131-item, validated, semi-quantitative, FFQ every 4 years

Study	Follow-up period	4-year intervals
NHS I	1986 – 2010 (24 years)	6
HPFS	1986 – 2010 (24 years)	6
NHS II	1991 – 2007 (16 years)	4

Exclusion Criteria

Baseline

- Obesity, diabetes, cancer, CVD, pulmonary/renal/liver disease
- > 65 years old
- Missing lifestyle data
- Implausible energy intake or > 70 blanks on FFQ

Censoring

- Diabetes, cancer, pulmonary/renal/liver disease (6 years prior)
- CVD (at time of diagnosis)
- > 65 years old

Statistical Analysis

- Multivariable linear regression with robust variance
- Exposure: 4y change in F&V (servings/d)
- Outcome: 4y change in weight (lbs)
during the same 4-year interval

Covariates

Change in:

Smoking status
Physical activity level
Hours sitting/watching TV
Hours of sleep

Change in intake of:

Fried potatoes
Juice
Whole grains
Refined grains
Fried foods
Whole-fat dairy
Low-fat dairy
Sugar-sweetened beverages
Sweets
Processed meats
Non-processed meats
% trans fat
Alcohol
Seafood

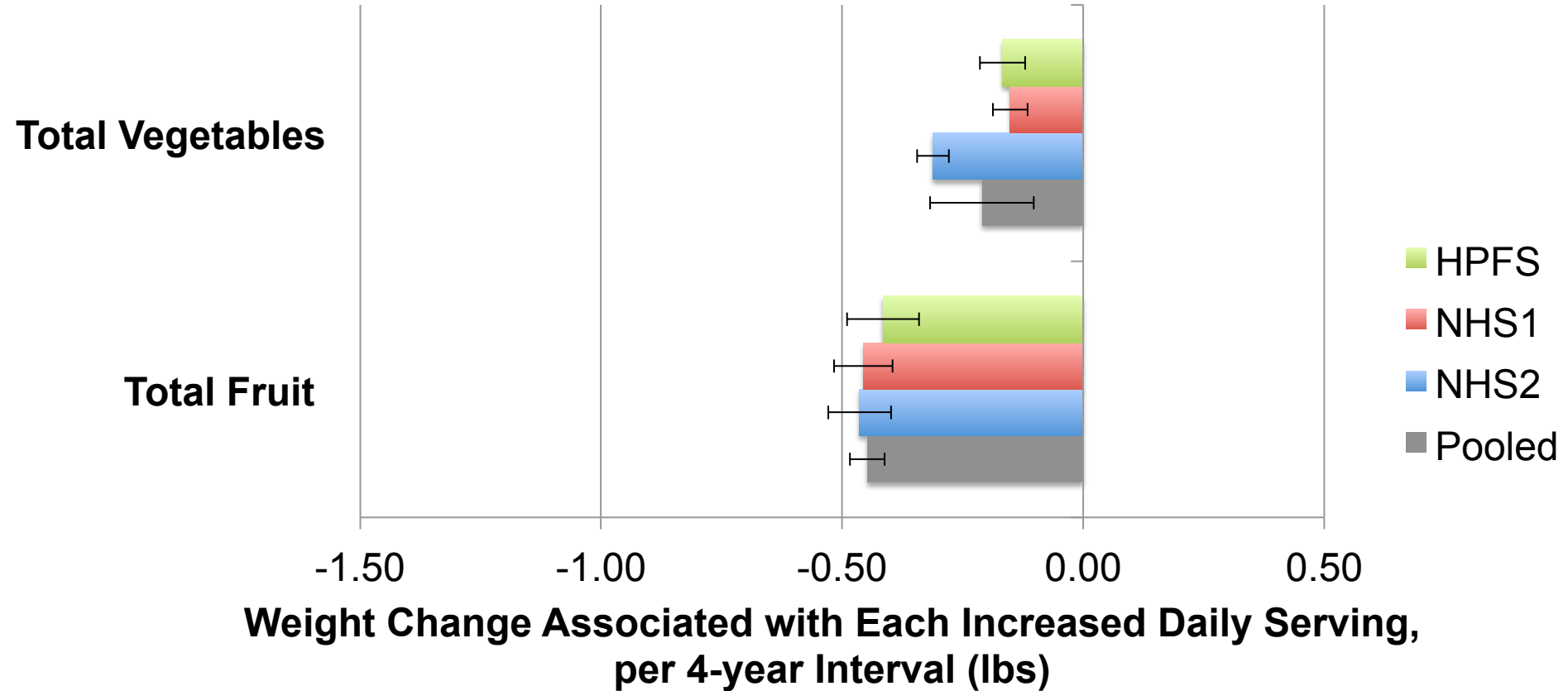
Baseline age

Baseline BMI

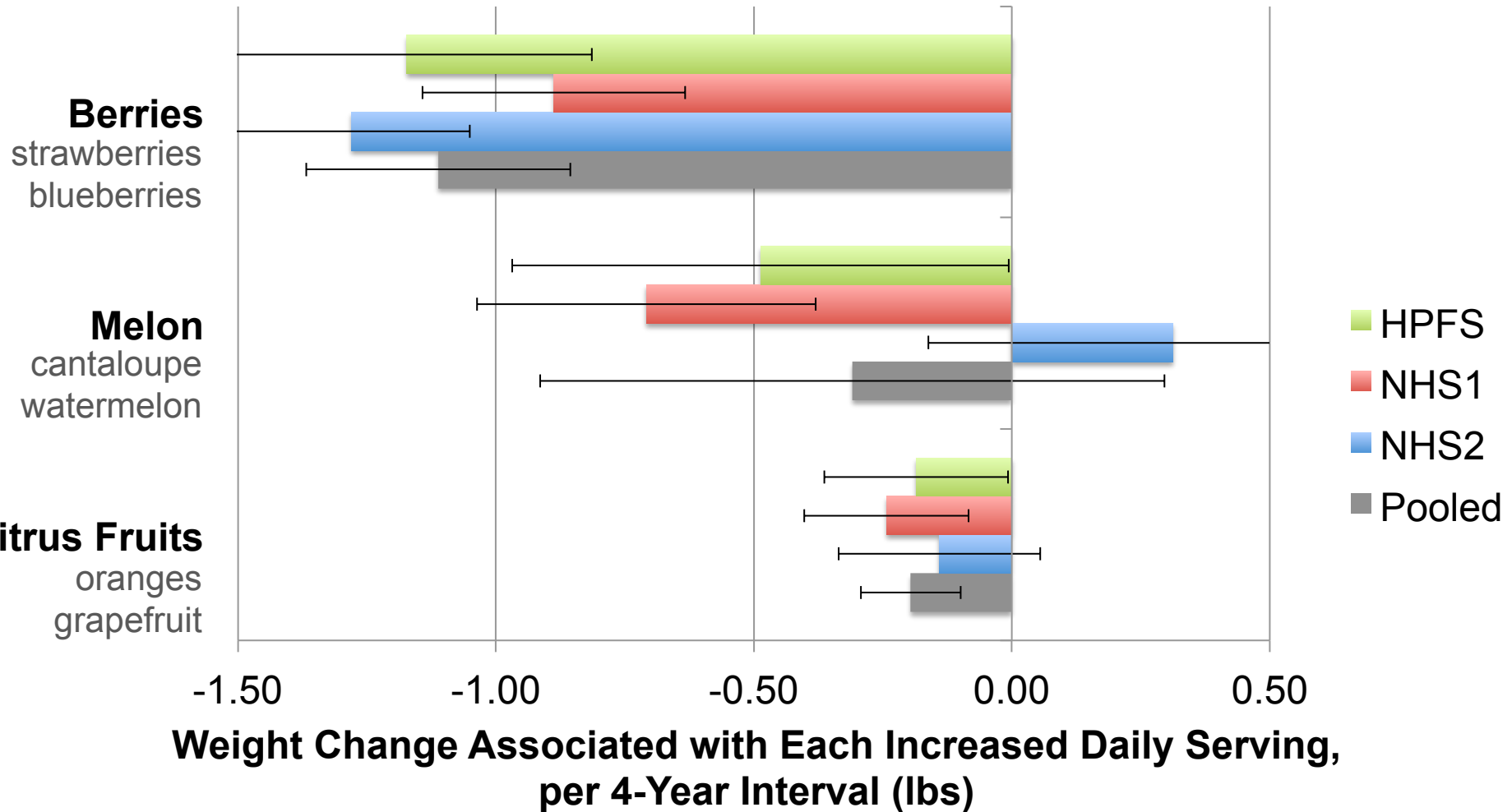
Baseline Characteristics, mean (SD)

	HPFS	NHS 1	NHS 2
	n = 17,219	n = 35,408	n = 62,975
Age (years)	46.8 (2.9)	48.6 (2.4)	36.3 (3.8)
Weight (lbs)	174 (13)	140 (9)	137 (17)
BMI (kg/m²)	24.6 (1.4)	23.5 (1.3)	22.8 (2.5)
Average 4-year weight change (lbs)	2.1	2.8	4.9
Physical activity (MET-hr/wk)	23.5 (19.7)	15.0 (10.0)	21.7 (24.4)
Alcohol (servings/d)	0.9 (0.7)	0.5 (0.4)	0.3 (0.4)
Sleep (hours/d)	7.1 (0.5)	7.0 (0.5)	7.0 (0.9)
Total fruit without juice (servings/d)	1.5 (0.7)	1.5 (0.5)	1.2 (0.8)
Total vegetables (servings/d)	2.9 (1.0)	3.2 (0.8)	3.1 (1.7)
Low-fat dairy (servings/d)	0.9 (0.6)	0.9 (0.4)	1.1 (0.9)
Whole grains (servings/d)	1.5 (0.8)	0.8 (0.4)	1.3 (1.0)

Total Fruits & Vegetables



Fruit Subtypes



Vegetable Subtypes

Cruciferous Vegetables

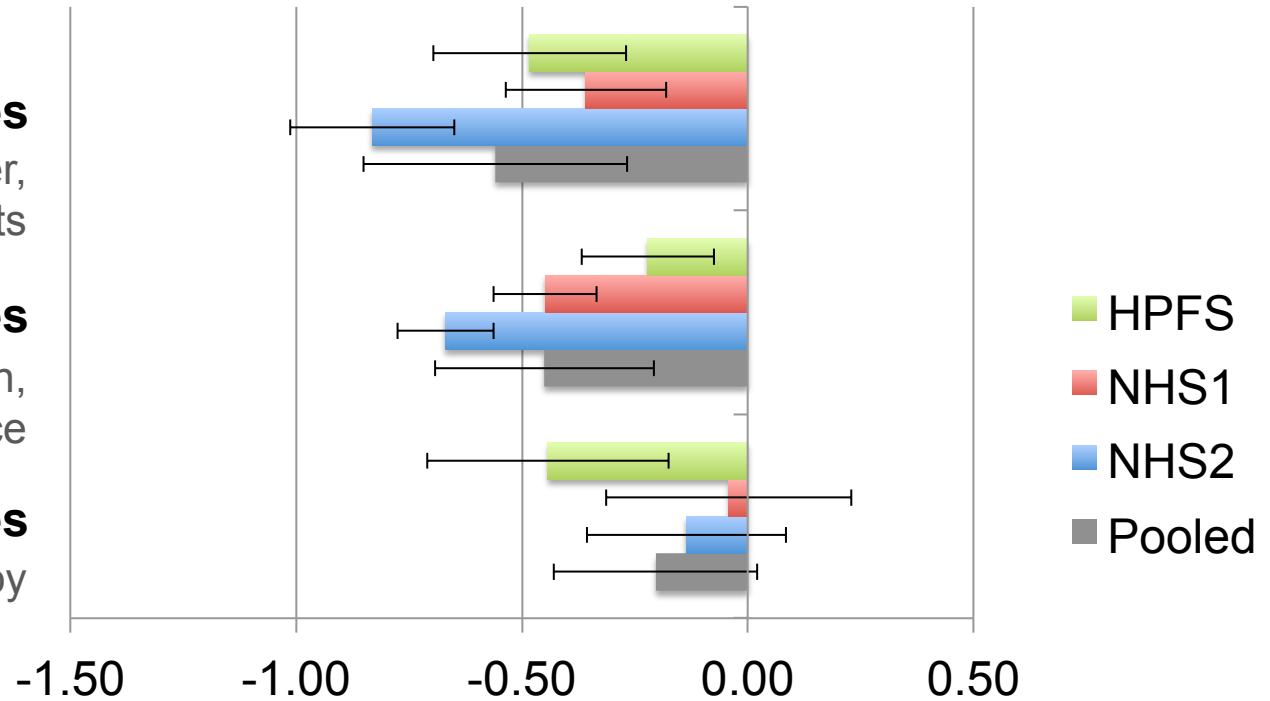
broccoli, cauliflower,
cabbage, brussels sprouts

Green Leafy Vegetables

kale, spinach,
romaine & iceberg lettuce

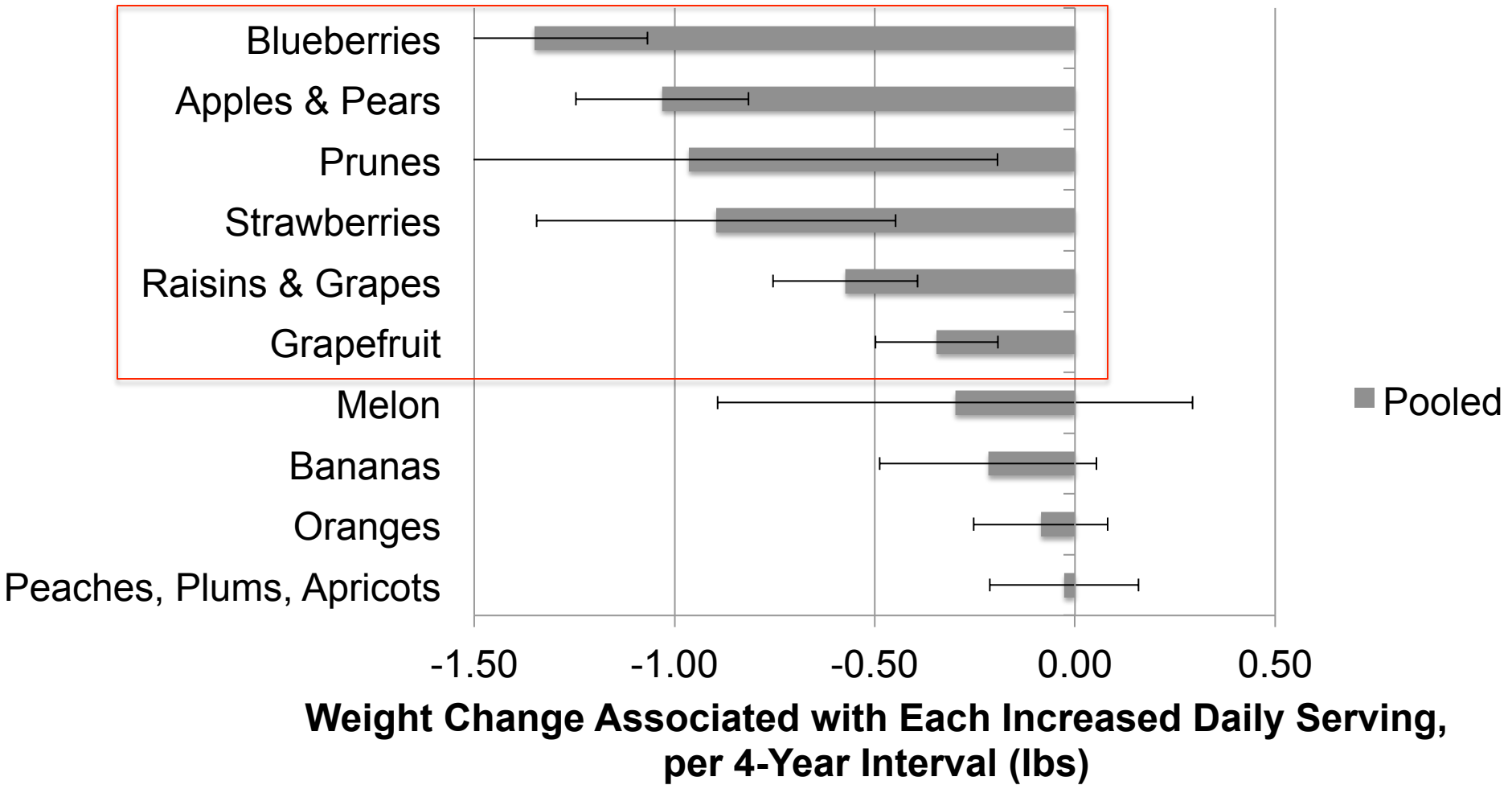
Legumes

peas, beans tofu/soy

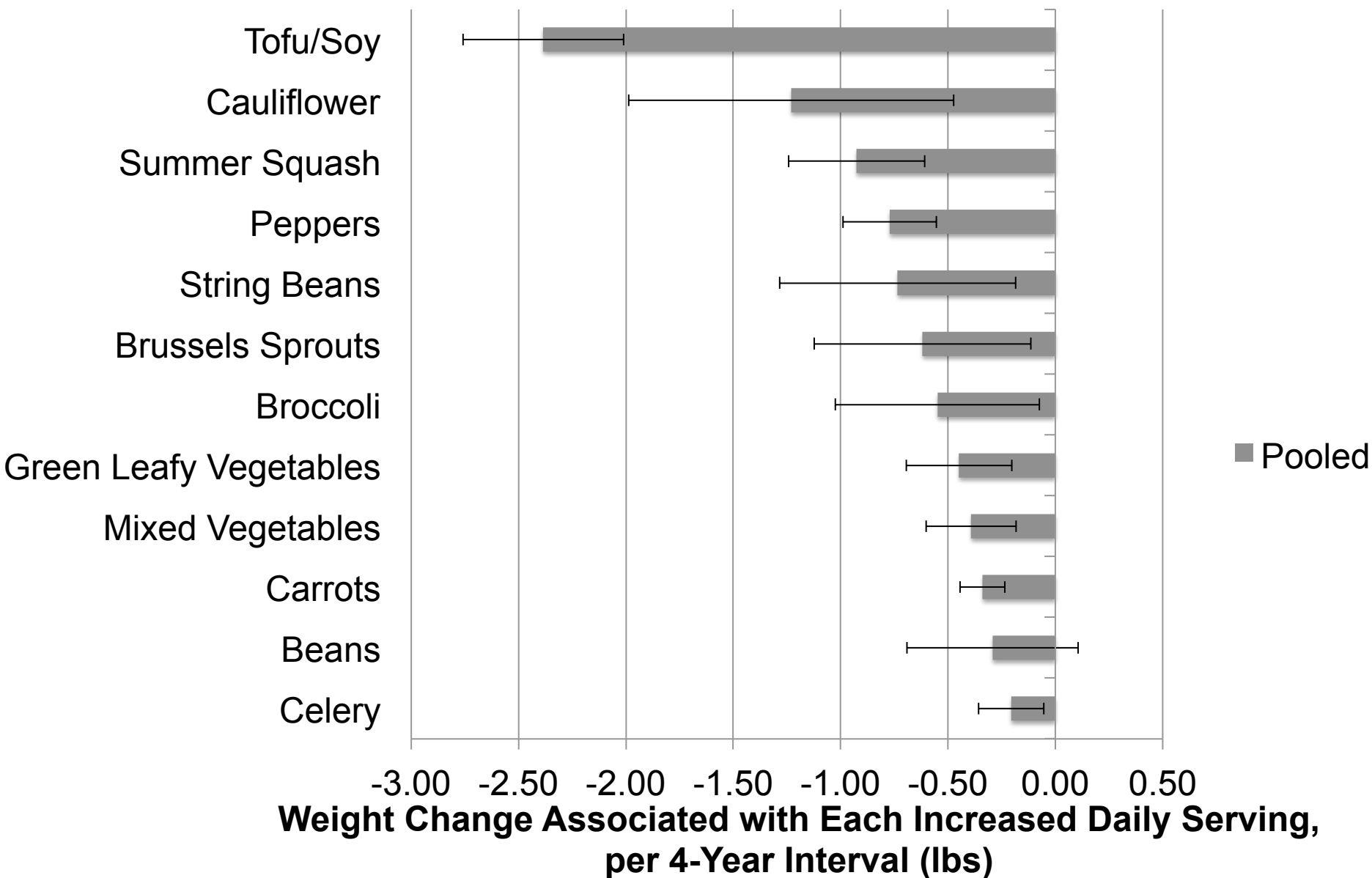


**Weight Change Associated with Each Increased Daily Serving,
per 4-Year Interval (lbs)**

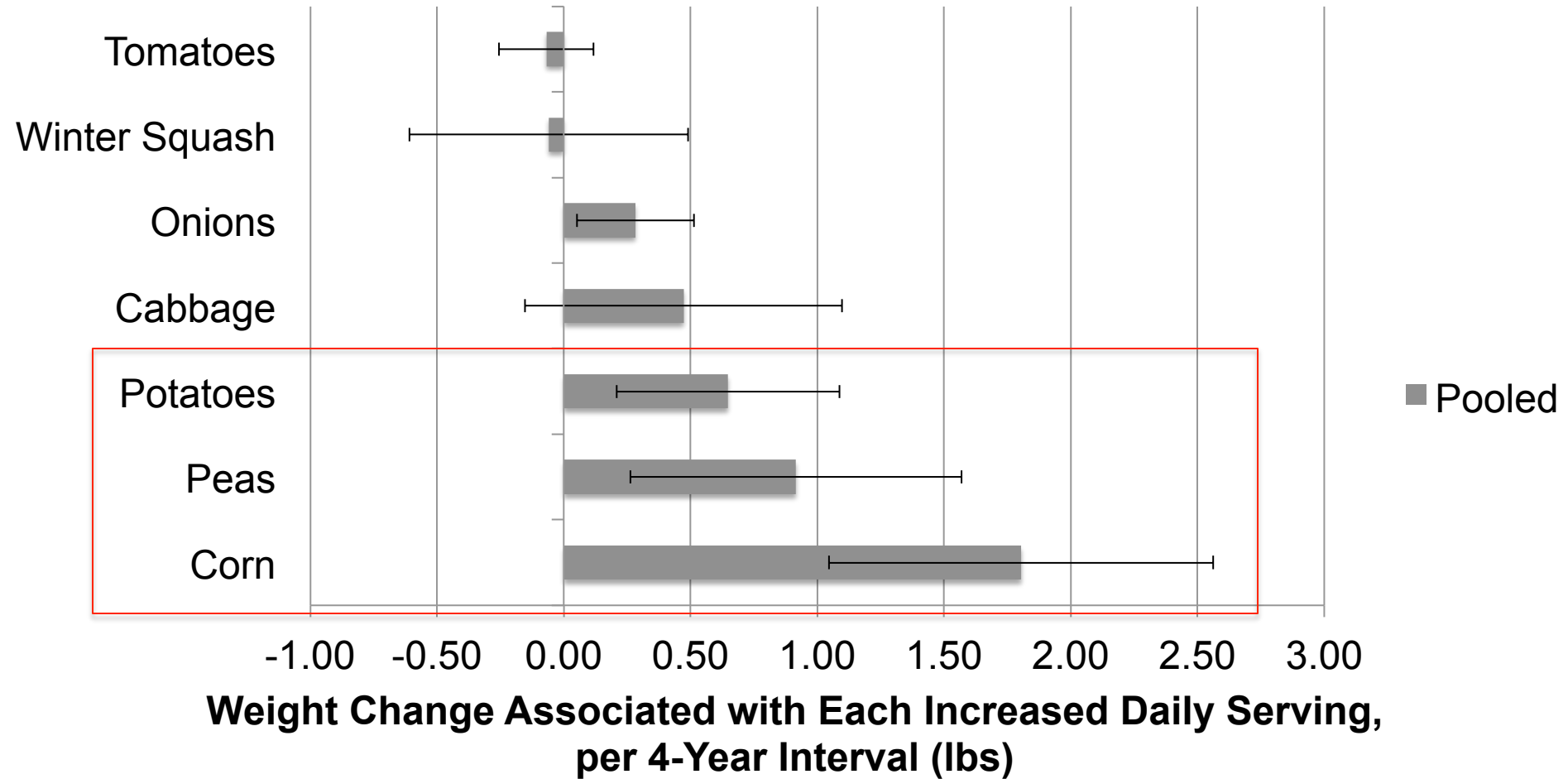
Individual Fruits



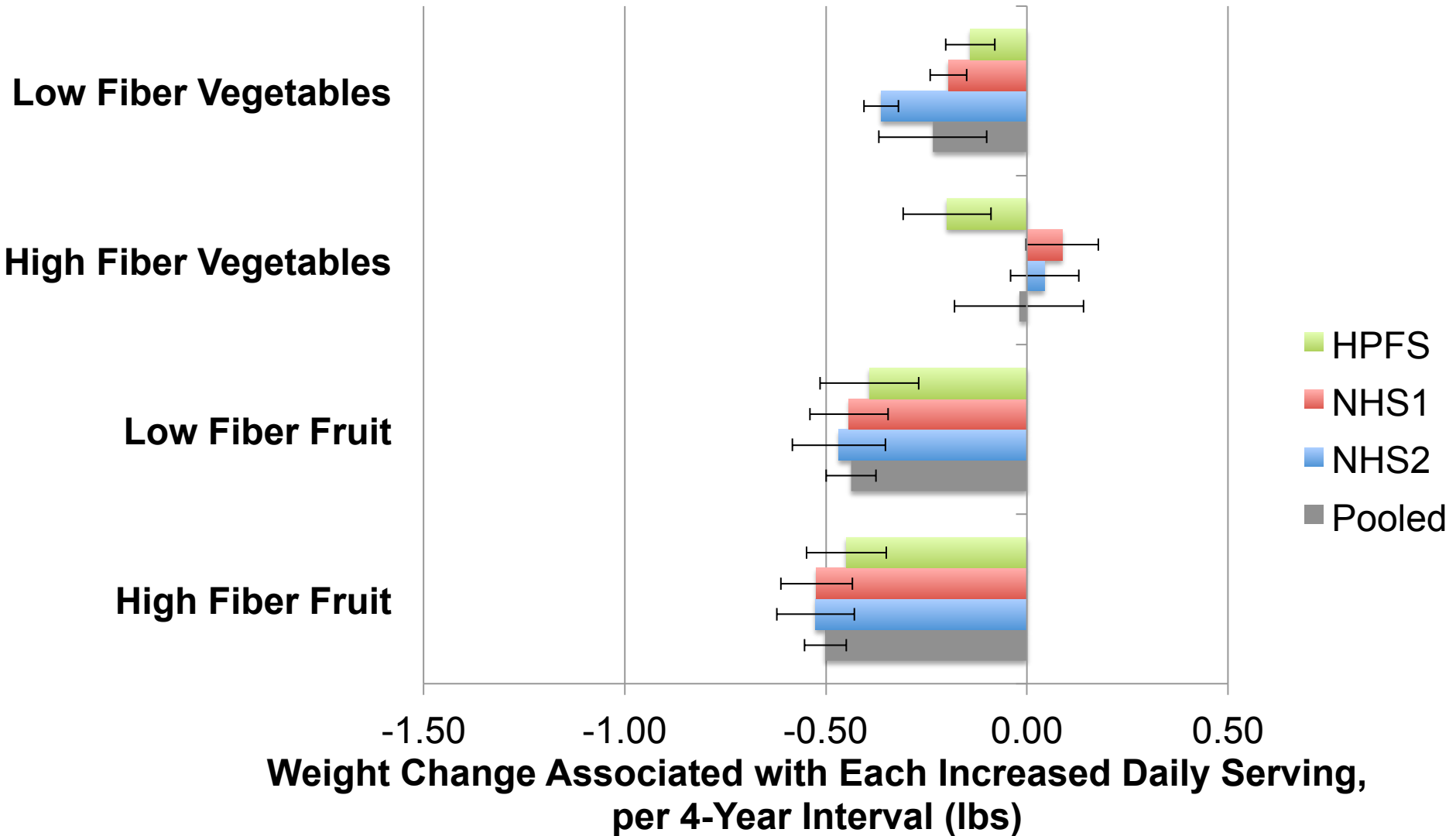
Individual Vegetables (Part 1)



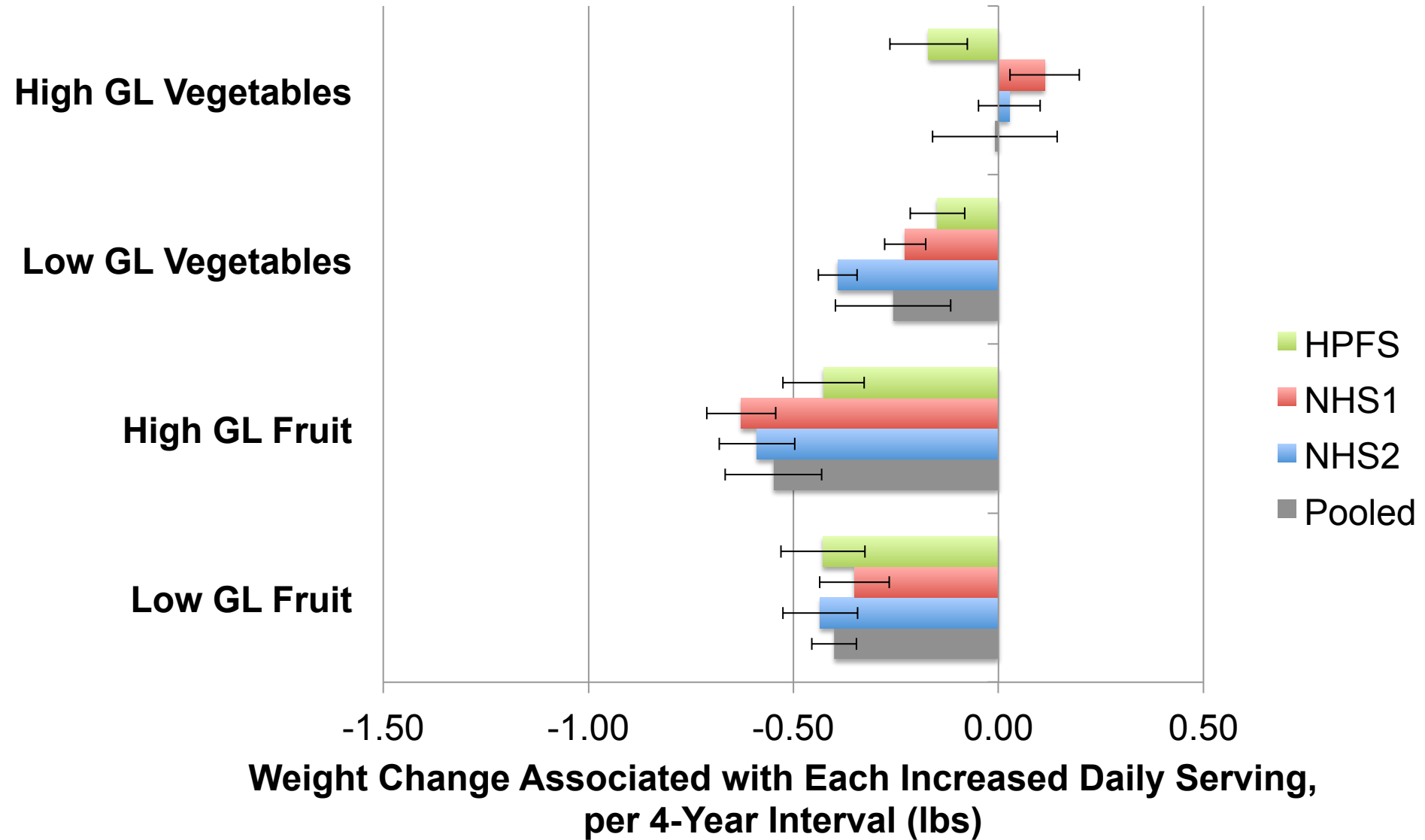
Individual Vegetables (Part 2)



Fruit & Vegetable Fiber Content



Fruit & Vegetable GL



Summary

- Increased total F&V intake inversely associated with weight change
- Magnitude of change larger for fruits vs. vegetables
- Wide-ranging associations for each type
- Increased intake of corn, peas, potatoes positively associated with weight change

Public Health Implications & Future Direction

- Advice to “eat less and exercise more” may not be optimal
- Despite higher carbohydrate content, fruits more strongly associated with weight change than vegetables

Acknowledgements



Co-authors

- Eric Rimm (senior author)
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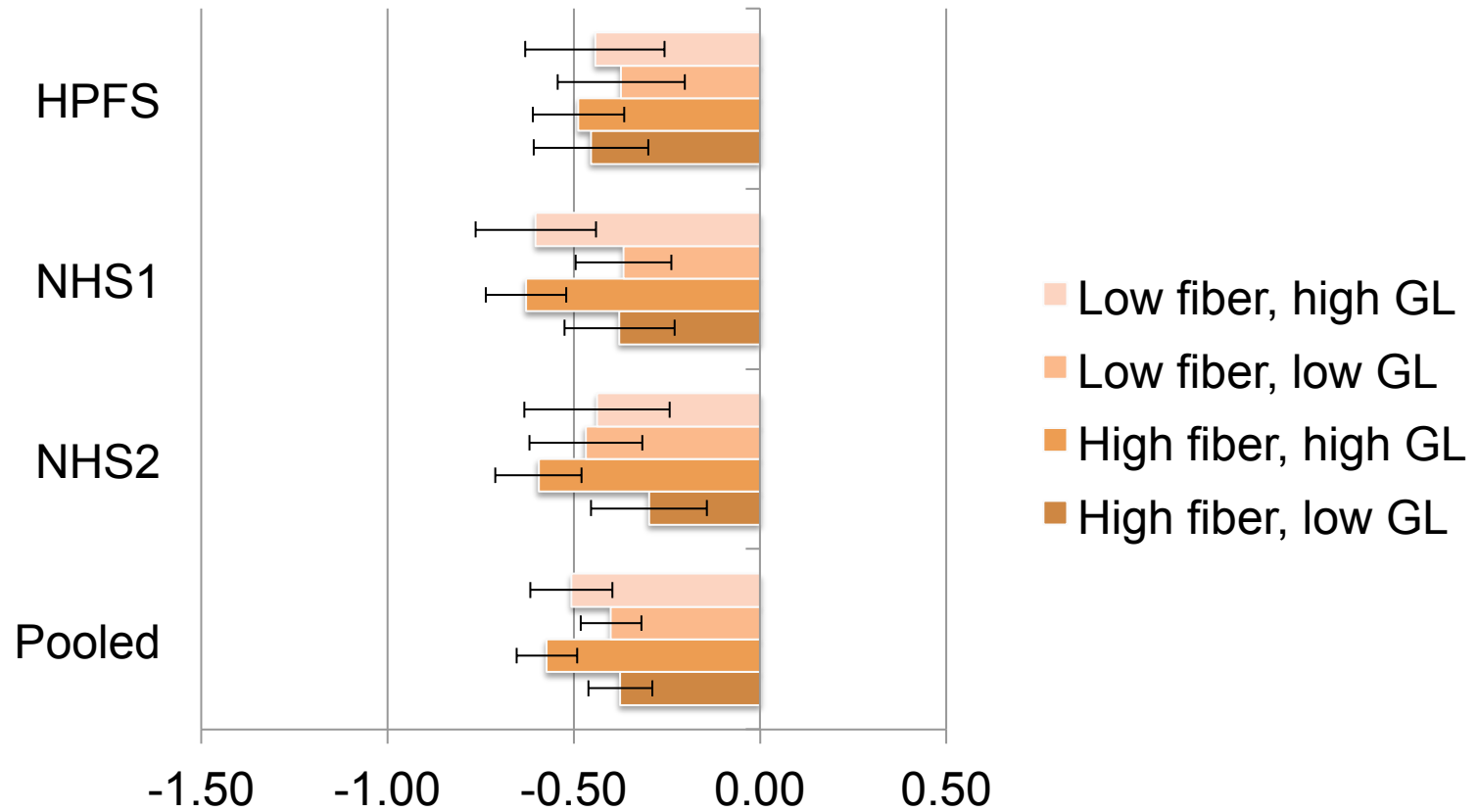
Colleagues

- Kim Overvad
- Anne Mette Wurtz
- Mette Hansen

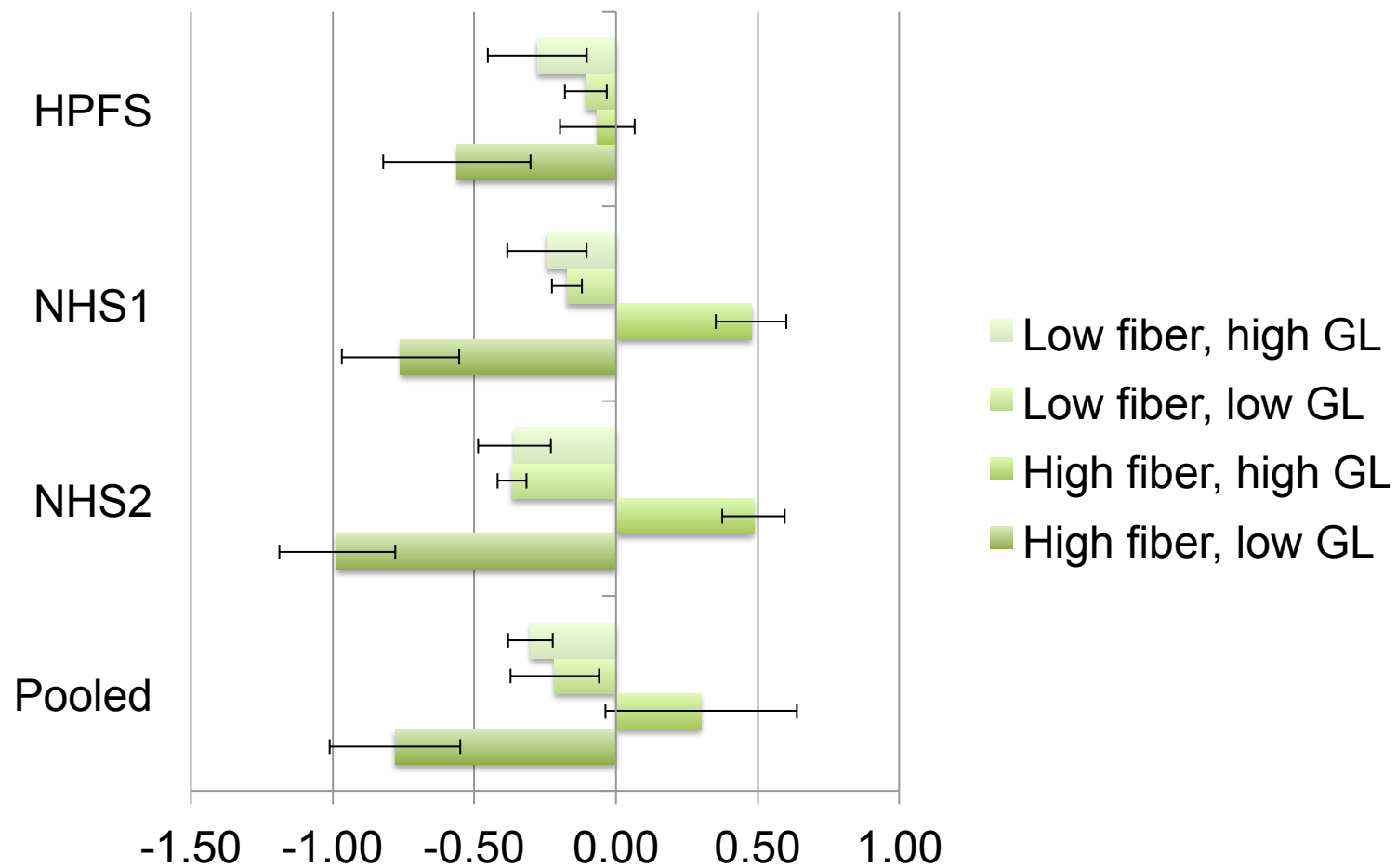
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- HPFS and NHS Participants
- Channing Laboratory

Fruit



Vegetables



Strengths & Limitations

- Repeated, validated FFQ
- 24 y follow-up
- 115,602 adults
- FFQ measurement error
- Unclear timing
- Population limited to mainly White, educated adults