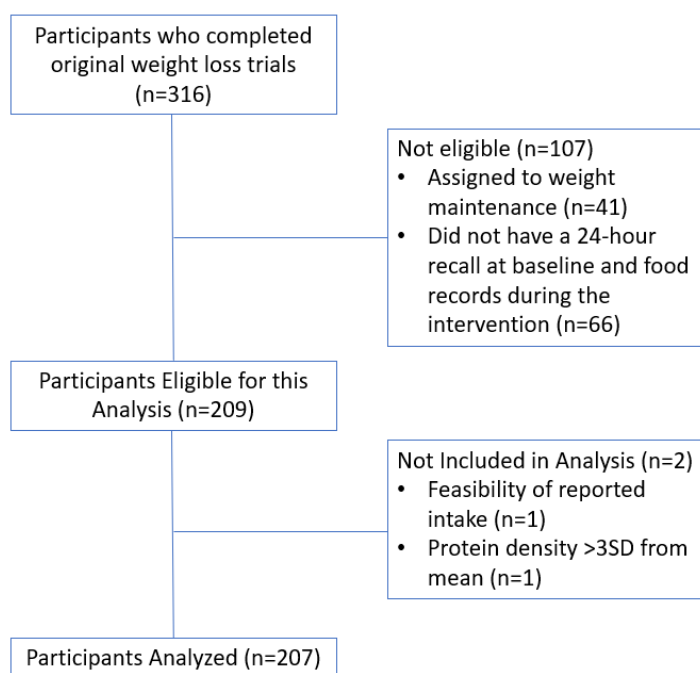


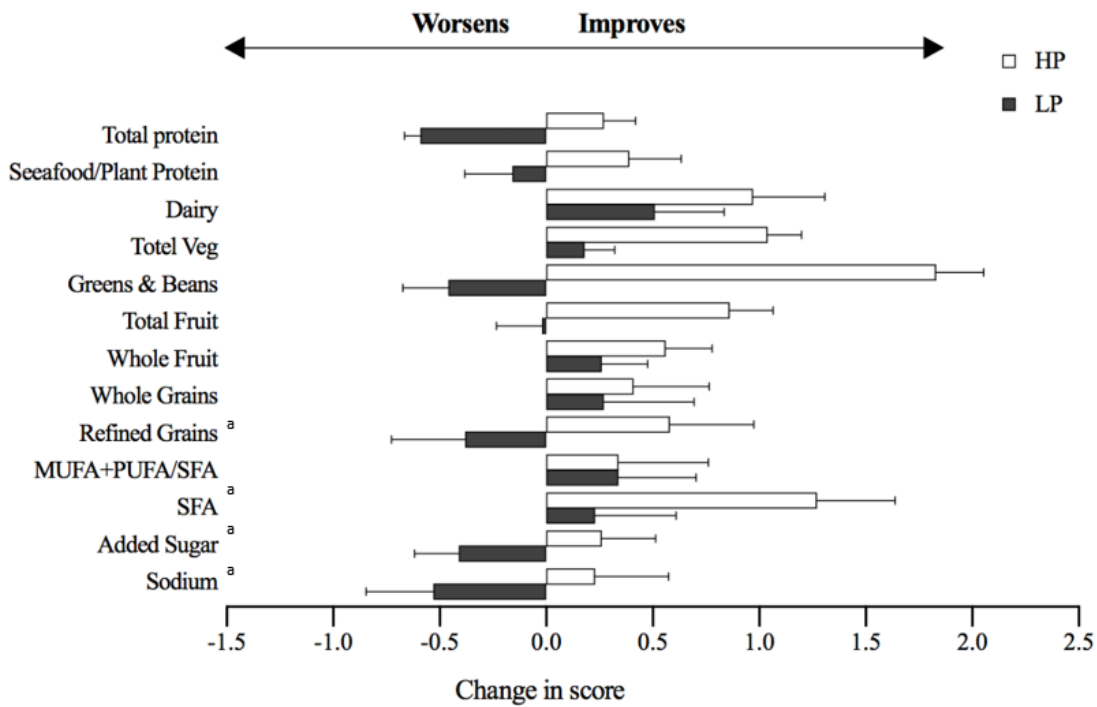
## SUPPLEMENTARY MATERIAL

Higher protein intake during caloric restriction improves diet quality and attenuates loss of lean body mass. Ogilvie, AR, Schlussek Y, Sukumar D, Meng L, Shapses SA.

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**Figure S1.** Flow diagram of participants



**Figure S2.** Change in diet quality scores for food categories in the HEI-2015 due to caloric restriction in the higher (HP) and lower (LP) protein groups.

Values are reported as Mean  $\pm$  SEM. The change in protein intake from baseline to caloric restriction differed ( $p < 0.001$ ) between the LP group ( $-32.0 \pm 20.1$  g/d) and the HP group ( $13.1 \pm 13.6$  g/d).

<sup>a</sup> Indicates HEI moderation component (for these categories, a higher score indicates lower intake).

Values are significantly different between HP and LP groups for total protein, greens and beans, and refined grains ( $p < 0.001$ ) and showed a trend to differ for seafood & plant proteins and dairy ( $p < 0.09$ ). Abbreviations: Healthy eating index-2015 (HEI), monounsaturated fat (MUFA), polyunsaturated fat (PUFA), saturated fat (SFA)

**Table S1:** Enrollment, objectives, and endpoints for weight loss trials in this study (OWLE database)

<b>Trial</b>	NIHMS576257*	NIHMS576252*	NCT00473031	NCT00472745	NCT01631292
<b>Participants enrolled (n)</b>	73	58	60	44	81
<b>Enrollment period</b>	2000-2003	2002-2004	2005-2008	2007-2012	2012-2015
<b>Population characteristics (BMI kg/m<sup>2</sup>)</b>	Female 50-75 y BMI 25-40	Female 25-49 y BMI 25-40	Female 50-70 y BMI 25-40	Male 50-72 y BMI 25-39.9	Female 50-70 y BMI 25-40
<b>Trial duration (months)</b>	6	6	12	6	12
<b>Objectives</b>	To examine hormonal mechanisms regulating bone turnover and mass and the role of Ca intake during weight reduction. <sup>21</sup>	To determine whether bone loss is observed with moderate weight loss at recommended or higher Ca intakes in premenopausal women. <sup>22</sup>	To examine higher protein compared with normal protein intake on BMD during CR with recommended calcium and vitamin D intakes. <sup>23</sup>	To examine variables of bone quality and endocrine changes after intentional weight loss. <sup>20</sup>	To determine whether there is a dose-dependent effect of vitamin D3 supplementation on BMD, geometry, strength, and bone microstructure. <sup>19</sup>
<b>Primary Endpoints</b>	Bone mineral density and bone mineral content	Bone mineral density	Bone mineral density (areal & volumetric), bone turnover markers	Bone mineral density and bone structural parameters	Bone mineral density and bone structural parameters
<b>Secondary Endpoints</b>	Parathyroid hormone (PTH) 25OHD	True fractional calcium absorption	Hormones IGF- 1, 25OHD, PTH)	25OHD, total testosterone, estradiol, SHBG, and albumin	Bone turnover and serum total, free, and bioavailable 25OHD

\*Clinical trials were conducted before registration of trials became routine practice (NIHMS number refers to the original articles). Abbreviations: body mass index (BMI); bone mineral density (BMD); caloric restriction (CR), Osteoporosis, Weight loss and Endocrine, OWLE; sex hormone binding globulin, SHBG, 25-hydroxyvitamin D<sub>3</sub> (25OHD).

**Table S2:** Regression coefficients and 95% CI of protein sources on the change in total protein intake due to caloric restriction in 207 adults with obesity and overweight

Food Item	$\beta$ coefficient (95% CI)	P value
Poultry	6.799 (5.866, 7.731)	<b>&lt;0.001</b>
Meat <sup>a</sup>	6.138 (5.034, 7.243)	<b>&lt;0.001</b>
Seafood	5.160 (4.099, 6.222)	<b>&lt;0.001</b>
Cured Meat <sup>b</sup>	5.022 (3.715, 6.328)	<b>&lt;0.001</b>
Cheese	7.549 (4.759, 10.339)	<b>&lt;0.001</b>
Milk	7.372 (4.195, 10.549)	<b>&lt;0.001</b>
Eggs	6.056 (3.146, 8.965)	<b>&lt;0.001</b>
Nuts and Seeds	2.254 (0.807, 3.700)	<b>0.002</b>
Yogurt	2.483 (-4.930, 9.895)	0.510
Organ Meat	-1.89 (-9.437, 5.658)	0.622
Soy	1.072 (-5.659, 7.804)	0.754
Legumes	-0.013 (-2.320, 2.294)	0.991

Controlled for energy, age, sex, and BMI.  $R^2=0.698$ ; Values are bolded when  $p < 0.05$

<sup>a</sup> Meat does not include poultry, or any organ or cured meat.

<sup>b</sup> Cured meats reflects all sliced deli meats including turkey.

Note: Other minimally consumed sources of protein (algae, insects, etc.), were not included because they are not reported by the USA version of the ASA nutrient analysis output.

**Table S3.** Regression coefficients and 95% CI for change in food components contributing to the change in the Healthy Eating Index (HEI) due to caloric restriction in 207 adults with obesity and overweight

Dietary variables	Model 1		Model 2	
	$\beta$ coefficient (95% CI)	P value	$\beta$ coefficient (95% CI)	P value
Total Protein	0.552 (-0.229, 1.332)	0.165	0.581 (-0.21, 1.372)	0.149
Seafood/Plant Protein	1.042 (0.636, 1.448)	<b>0.000</b>	1.045 (0.631, 1.458)	<b>0.000</b>
Total Dairy	0.307 (0.052, 0.563)	<b>0.019</b>	0.312 (0.054, 0.570)	<b>0.018</b>
Total Vegetables	0.457 (-0.177, 1.09)	0.157	0.431 (-0.216, 1.078)	0.191
Greens & Beans	0.606 (0.194, 1.019)	<b>0.004</b>	0.615 (0.195, 1.036)	<b>0.003</b>
Total Fruit	1.837 (1.018, 2.656)	<b>0.000</b>	1.818 (0.987, 2.648)	<b>0.000</b>
Whole Fruit	0.462 (-0.267, 1.190)	0.213	0.464 (-0.273, 1.202)	0.216
Whole Grains	0.987 (0.738, 1.236)	<b>&lt;0.001</b>	0.972 (0.718, 1.227)	<b>&lt;0.001</b>
Refined Grains	0.887 (0.621, 1.153)	<b>&lt;0.001</b>	0.893 (0.624, 1.162)	<b>&lt;0.001</b>
MUFA+PUFA/SFA	0.519 (0.219, 0.819)	<b>&lt;0.001</b>	0.524 (0.215, 0.833)	<b>&lt;0.001</b>
SFA	0.746 (0.424, 1.069)	<b>&lt;0.001</b>	0.744 (0.415, 1.072)	<b>&lt;0.001</b>
Added Sugar	0.178 (-0.261, 0.617)	0.426	0.175 (-0.272, 0.622)	0.441
Sodium	0.306 (0.042, 0.569)	<b>0.023</b>	0.316 (0.048, 0.584)	<b>0.021</b>

The models (1 and 2) include food components that contribute to HEI. Model 1 is unadjusted, and Model 2 is adjusted for age, sex, and body mass index. Values are bolded when  $< 0.05$ . Abbreviations: caloric restriction (CR); monounsaturated fatty acids (MUFA); polyunsaturated fatty acid (PUFA), saturated fatty acids (SFA).