Diet and Cancer in a U.S. cohort Containing many Vegetarians.

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Cohort Profile: Adventist Health Study-2

- **Prospective** cohort study

- **96,001 (25,000 Blacks**)

- Enrollment 2002-2007

From all **US states and Canada.**

Butler TL et al. Cohort Profile: The Adventist Health Study-2 (AHS-2). Int J Epidemiol 2008; 37:260-65.

Cohort Profile: AHS-2 Aims (NCI grant)

Primary Aims

1. *To investigate associations between vegetarian dietary patterns and risk of cancers of the breast, prostate and colon.*

2. *To isolate more specific dietary variables (foods, food groups, nutrients, phyto-chemicals) that relate to risk of these cancers...*

   a. Red Meat
   b. Cruciferous Vegetables
   c. Dairy (soy, calcium supplements considered in the analysis) with colon cancer
   d. Tomatoes
   e. Foods with low glycemic index (in addition to computing a glycemic index)
   f. Soy foods

Classification of Dietary Patterns

	Number	%	Diet
Vegan	9,062	8.5%	Meat & Fish < 1/mo Dairy/Egg < 1/mo
Lacto-Ovo-Vegetarian	30,103	31%	Meat & Fish < 1/mo Dairy/Egg > 1/mo
Pesco-Vegetarian	9,793	10%	Meat < 1/mo Fish > 1/mo Dairy/Egg > 1/mo
Semi-Vegetarian	4,801	5.5%	1/mo<Meat+Fish < 1/wk Dairy/Egg > 1/mo
Non-Vegetarian	42,410	45%	Meat & Fish > 1/wk Dairy/Egg > 1/mo

Average Duration (yrs) of Present Dietary Pattern among subjects in AHS-2

Type of Vegetarian

■ Non-Vege ■ Lacto-Ovo ■ Semi-Vege ■ Vegan ■ Pesco
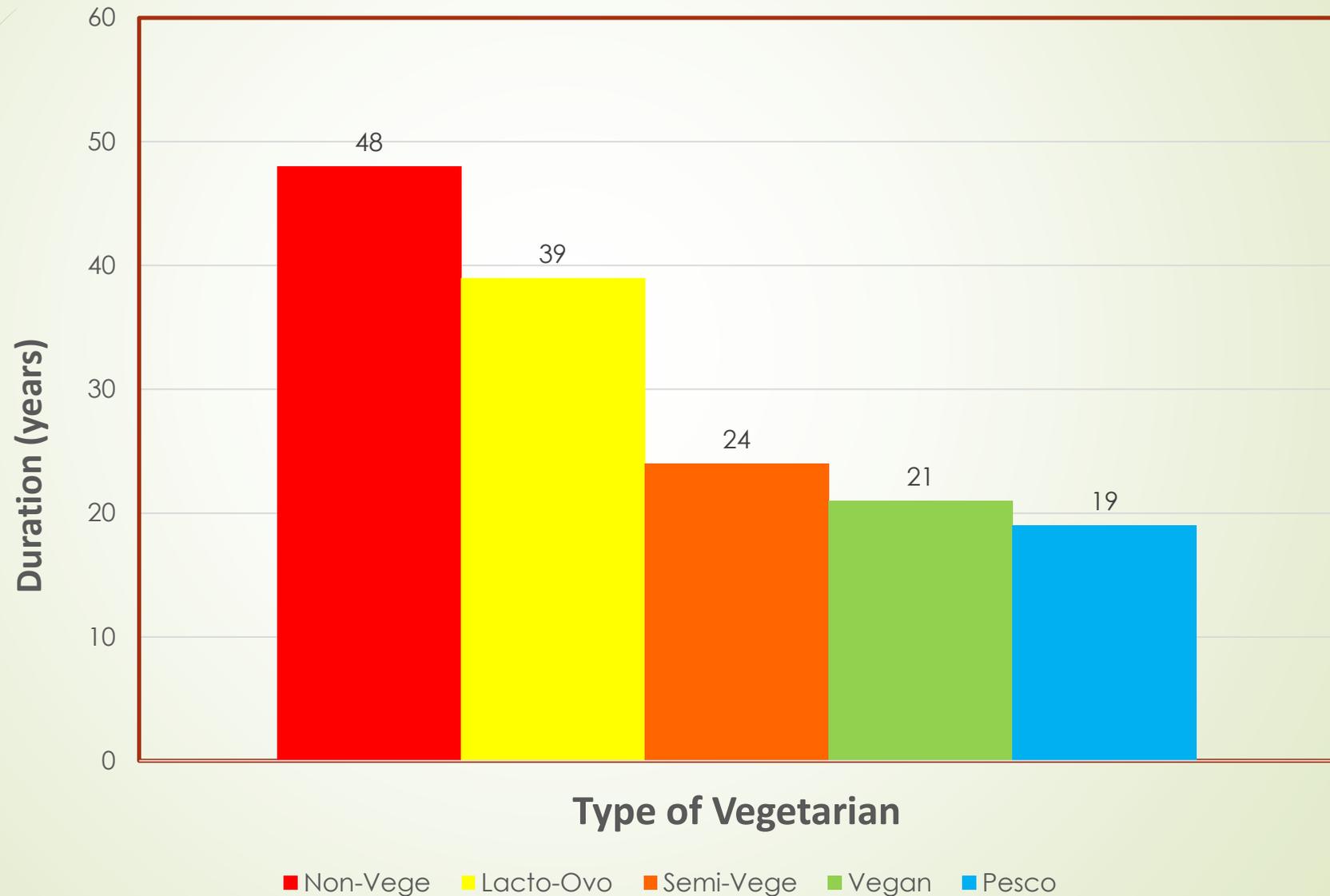
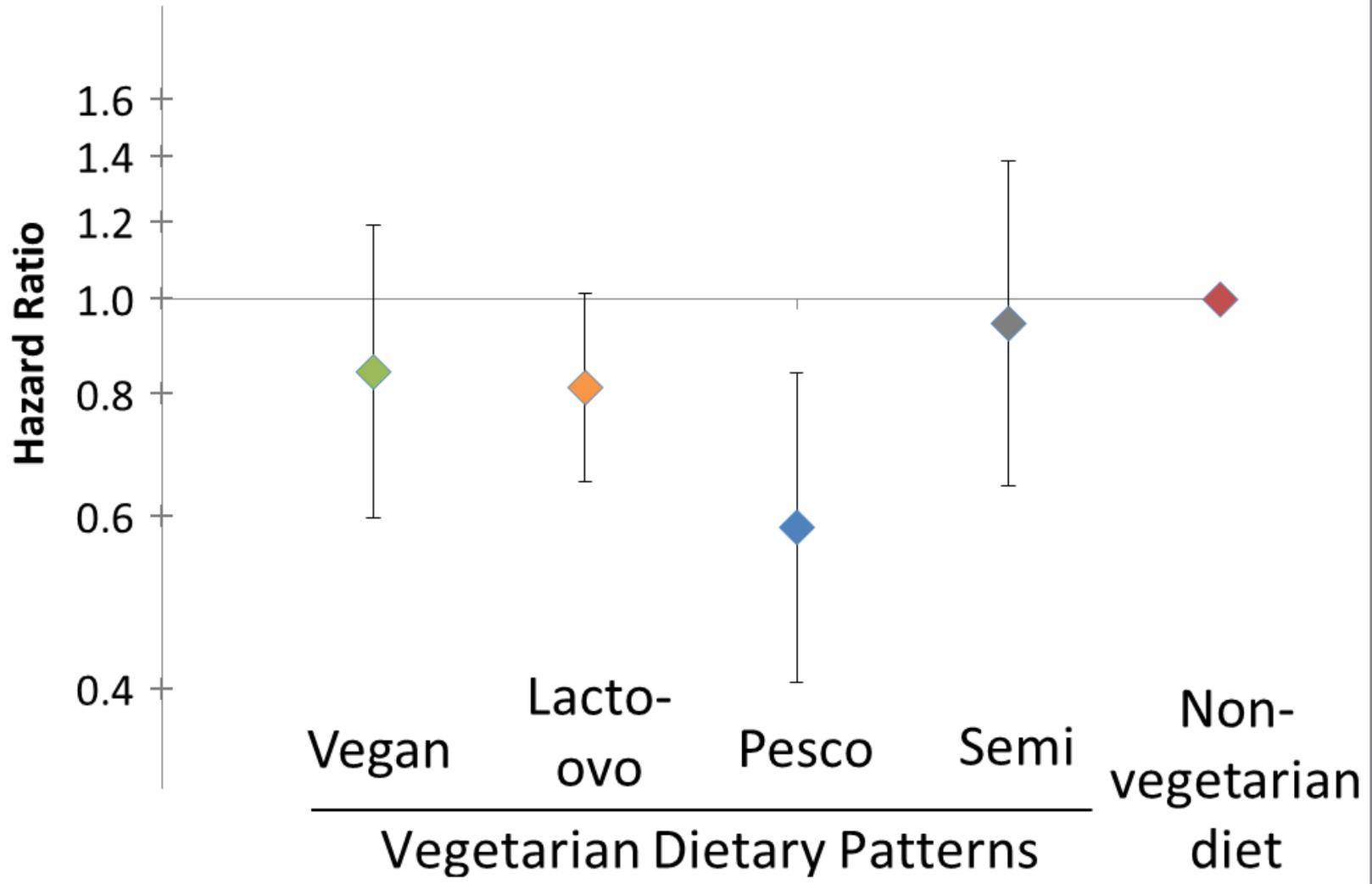# Diet Pattern and Incident Colorectal Cancer
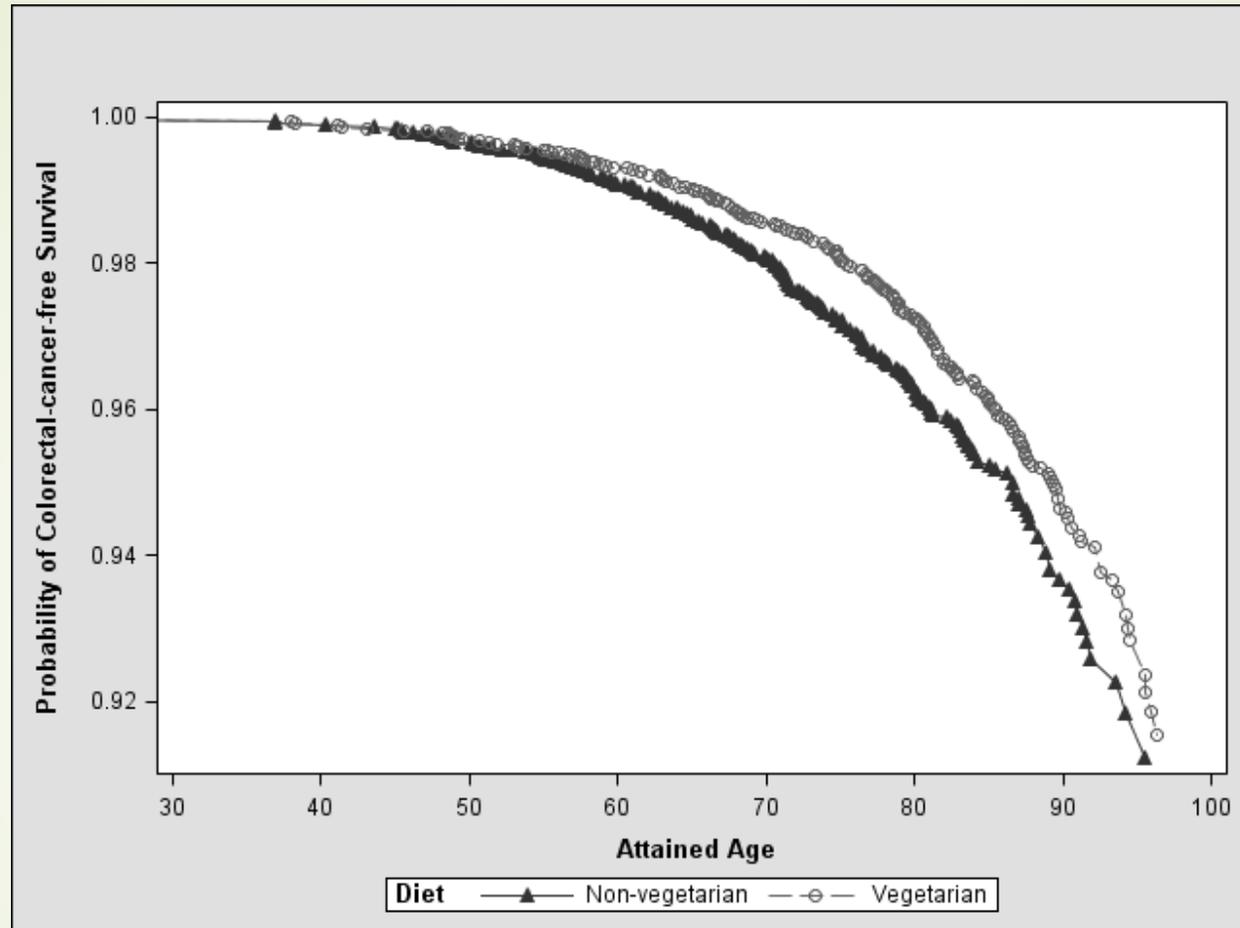
Probability of surviving to a given age without having received a diagnosis of **colorectal cancer** (i.e. colorectal-cancer-free survival) for all vegetarians versus non-vegetarians. Generated by PROC PHREG, SAS 9.4; race and sex held constant.

Colorectal Cancer:
All Vegetarians vs. non-vegetarians

Model	Diet	N	Cases	HR (95% CI)	p value
1: Basic	Veg	40,367	252	0.80 (0.67-0.96)	0.02
	Non-veg	37,292	238	1 (reference)	ref
2: Full	Veg	40,367	252	0.78 (0.64-0.95)	0.01
	Non-veg	37,292	238	1 (reference)	ref
3: + BMI	Veg	40,367	252	0.79 (0.64-0.97)	0.03
	Non-veg	37,292	238	1 (reference)	ref

Adventist Health Study 2

A Legacy for Life

Colorectal Cancer Incidence
4 Vegetarian Diets vs. Nonvegetarians

JAMA Intern Med. 2015;175(5):767-776

Hazard ratios for incident colorectal cancer according to intake of processed red meat. Results from the AHS-2.

PRELIMINARY, not for citation

Hazard Ratio

Processed Red Meat (grams/day)
(energy-adjusted)

—— HR Estimate · · · · · 1-sided 95% CL ▲ (0) g/day
■ (>0<=4.52) g/day ● (>4.52<=7.07) g/day ◆ (>7.07<=16.55) g/day
⊠ (>16.55) g/day — · — WHO Estimate
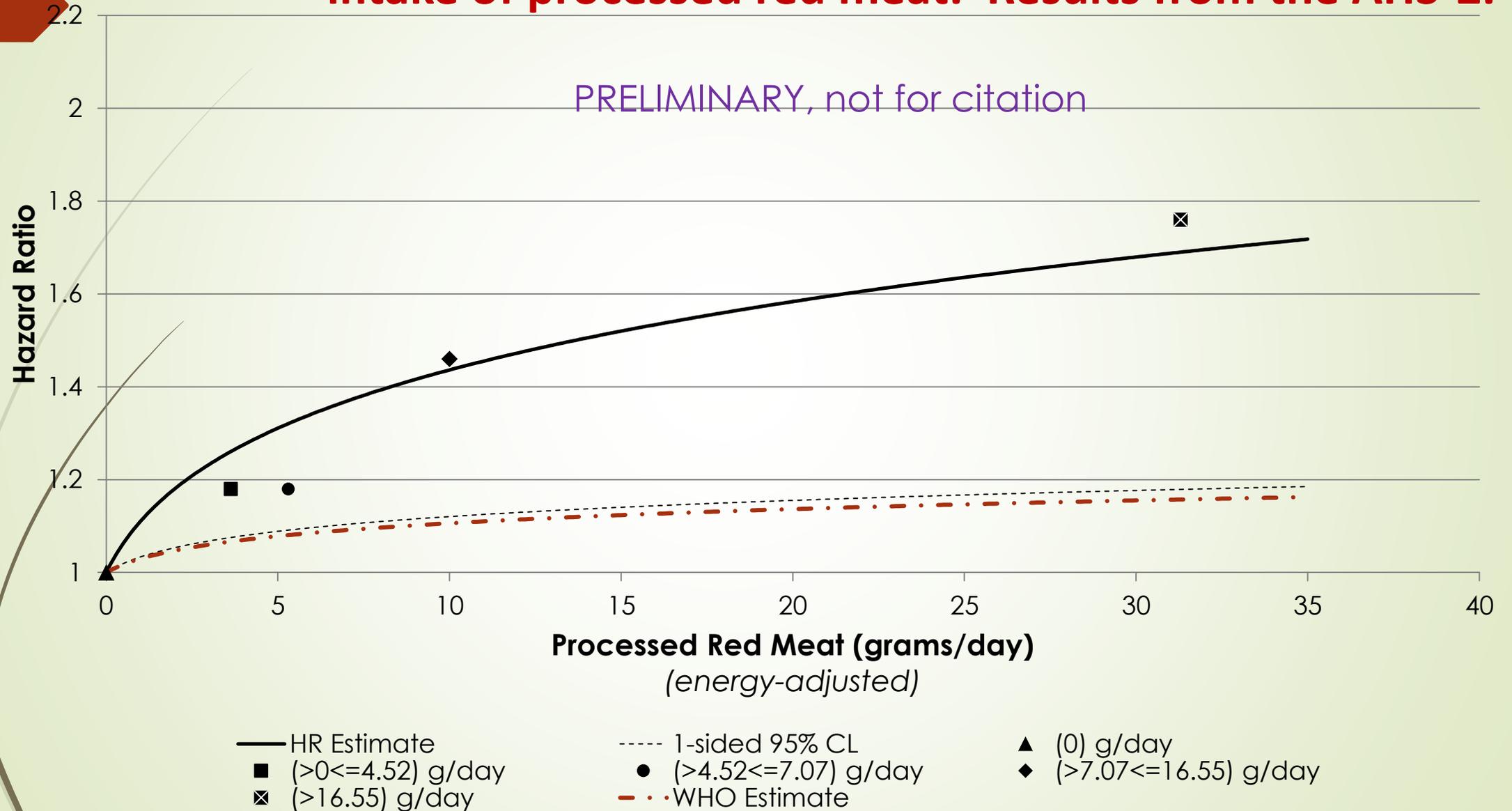
Prostate Cancer

| Age | Family History | Race | Diet | Hormones |

Age-adjusted and multivariate adjusted HR of the association between **vegetarian dietary patterns** and **prostate cancer incidence**

Prostate Cancer	Variables	Vegan	Lacto-vegetarian	Pesco-vegetarian	Semi-vegetarian	Non-Vegetarian
Overall	**Number of events**	**59**	**333**	**121**	**63**	**503**
	HR[1] (95%CI)	**0.64 (0.48, 0.83)**	0.94 (0.81, 1.08)	1.12 (0.92, 1.37)	1.11 (0.85, 1.46)	1.00
	HR[2] (95%CI)	**0.65 (0.49, 0.85)**	0.96 (0.83, 1.10)	1.06 (0.87, 1.30)	1.18 (0.91, 1.53)	1.00
	HR[3] (95%CI)	**0.66 (0.50, 0.87)**	0.96 (0.83, 1.12)	1.07 (0.88, 1.31)	1.18 (0.91, 1.54)	1.00
Advanced	**Number of events**	**15**	**70**	**28**	**13**	**111**
	HR[1] (95%CI)	0.70 (0.41, 1.20)	0.84 (0.62, 1.13)	1.09 (0.72, 1.66)	1.00 (0.56, 1.78)	1.00
	HR[2] (95%CI)	0.70 (0.41, 1.21)	0.86 (0.63, 1.17)	1.05 (0.69, 1.59)	1.07 (0.60, 1.90)	1.00
	HR[3] (95%CI)	0.78 (0.45, 1.35)	0.91 (0.66, 1.24)	1.10 (0.72, 1.68)	1.09 (0.61, 1.95)	1.00

[1] age-adjusted model
[2] multivariate model 1, includes: race, family history of prostate cancer, education, screening for prostate cancer, and Kcal
[3] multivariate model 2, includes model 1 plus BMI

Tantamango-Bartley et al. Am J Clin Nutr 2016;103:153-160.

Multivariate adjusted HR of the association between **vegetarian status** and **prostate cancer** incidence stratified by **race**

Dietary Patterns	Black			White		
	No of events	HR[1] (95%CI)	HR[2] (95%CI)	No of events	HR[1] (95%CI)	HR[2] (95%CI)
Non-Vegetarian	174	Reference	Reference	329	Reference	Reference
Vegan	**15**	**0.69 (0.41, 1.18)**	**0.67 (0.39, 1.15)**	**44**	**0.63 (0.46, 0.86)**	**0.65 (0.47, 0.90)**
Lacto-ovo-vegetarian	41	0.81 (0.57, 1.14)	0.80 (0.56, 1.13)	292	0.98 (0.83, 1.15)	1.00 (0.85, 1.18)
Pesco-vegetarian	46	1.18 (0.85, 1.63)	1.16 (0.84, 1.62)	75	1.00 (0.78, 1.29)	1.03 (0.80, 1.32)
Semi-vegetarian	14	1.55 (0.90, 2.69)	1.54 (0.89, 2.67)	49	1.10 (0.81, 1.48)	1.11 (0.82, 1.50)

[1] multivariate model 1 includes: family history of prostate cancer, education, screening for prostate cancer, and Kcal
[2] multivariate model 2 includes model 1 plus BMI

Tantamango-Bartley et al. Am J Clin Nutr 2016;103:153-160.

# Vegetarian Dietary Patterns and
Breast Cancer

Dietary Patterns and Incident Breast Cancer: Hazard Ratios compared to Non-vegetarians

Pattern	Partici-pants	Cases	HR no BMI	95%CI no BMI	HR with BMI	95% CI with BMI
Vegan	3,725	51	0.78	0.58-1.05	0.84	0.62-1.13
Lacto-Ovo	14,312	289	1.05	0.89-1.23	1.08	0.92-1.27
Pesco	5,077	88	0.91	0.71-1.17	0.94	0.73-1.21
Semi	2,953	49	0.91	0.67-1.23	0.91	0.68-1.24
Vegetarian	26,066	478	0.97	0.84-1.11	1.00	0.87-1.16
Non Vegetarian	24,223	414	Ref	Ref	1.00	Ref

Penniecook-Sawyers et al. Br J Nutrition (2016), 115, 1790-97.

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Probability of Survival without Breast Cancer by Dietary Pattern.
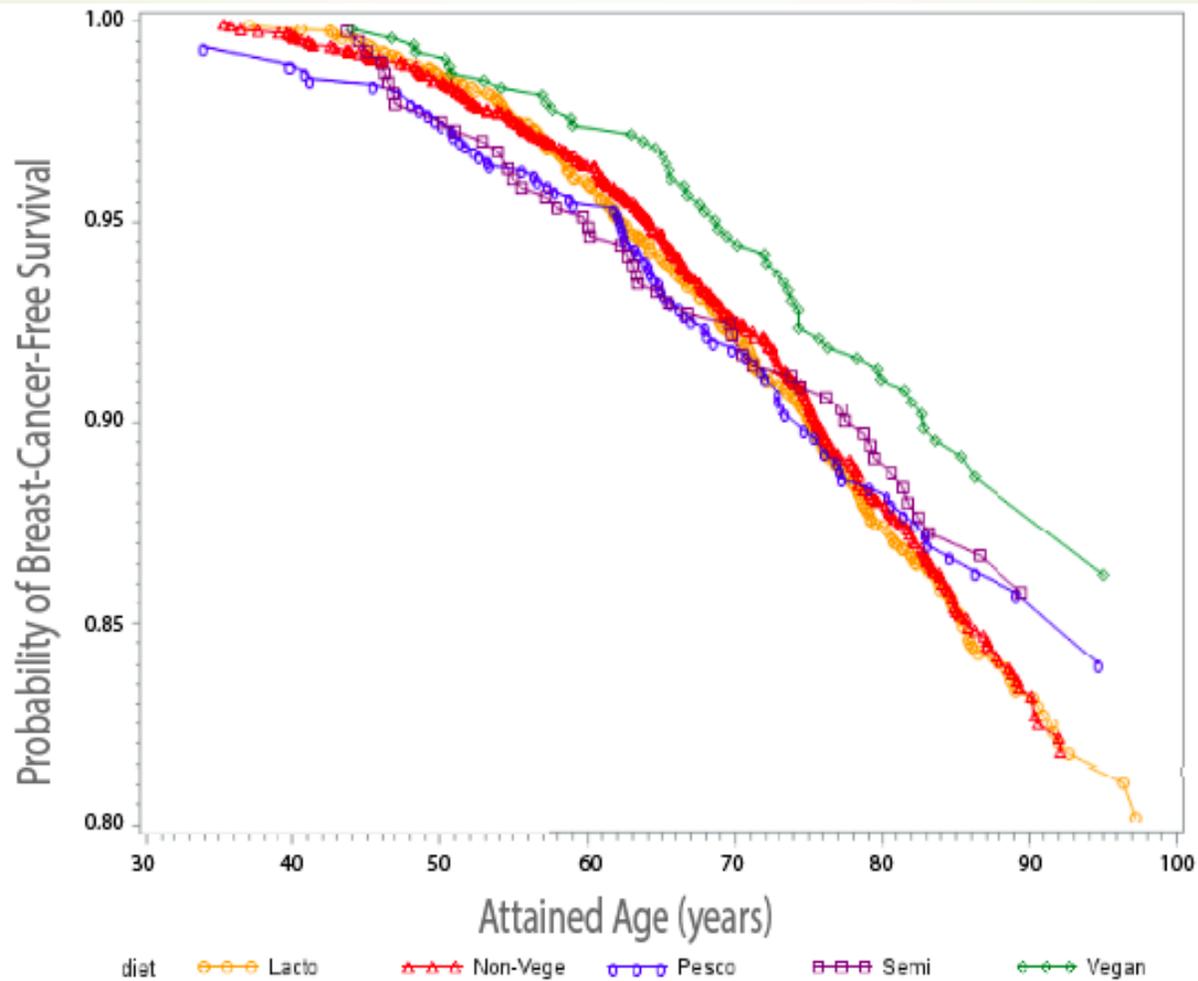
Adjusted for: Race, Adult Height, Physical Activity, Screening, Educational Level, Smoking, Alcohol, Family History of Breast or Ovarian Cancer, Age at Menarche, Menopause Status, Age at Menopause, Number of Births, Breast Feeding, Use of Oral Contraceptives.

Relative mean quantity eaten compared to non-vegetarians (adjusted for age, sex & race and standardized to 2000 kcal)

Legend:
- Vegan vs. Nonveg
- Lacto vs. Nonveg
- Pesco vs. Nonveg
- Semi vs. Nonveg

Categories (top to bottom): fruit, vegetables, avocados, potatoes, grains, legumes, soy foods & meat analogues, nuts & seeds, meat, dairy products, eggs, added fats, sweets, snack foods, beverages, drinking water

X-axis: 0.00, 0.50, 1.00, 1.50, 2.00, 2.50, 3.00

Orlich et al. Br. J. Nutr. 2014 Nov 28;112(10):1644-53.

Adventist Health Study 2 — A Legacy for Life

Conclusions

- Vegetarians - lower risk of colorectal cancer

- Processed red meat - stronger harmful effect on colorectal cancer in this population than what has been reported by WHO.

- Vegans - lower risk of both breast and prostate cancer.

- The association with meat and/or dairy, may be **complex** in that it could partly be due to other differences in dietary factors. e.g. dairy, fruits, vegetables, omega-3 FA, etc.

- Possible importance of **duration** of dietary habits

- Further studies needed – which specific dietary factors in the vegan or vegetarian diet that are related to cancer risk.

Questions ?