



Intake of Dairy Products in Relation to Risk and Survival of Prostate Cancer

— A 28-year follow-up study

Yan Song, MD, MS

Channing Network Medicine, Brigham & Women's Hospital and Harvard Medical School
Department of Epidemiology, UCLA Fielding School of Public Health



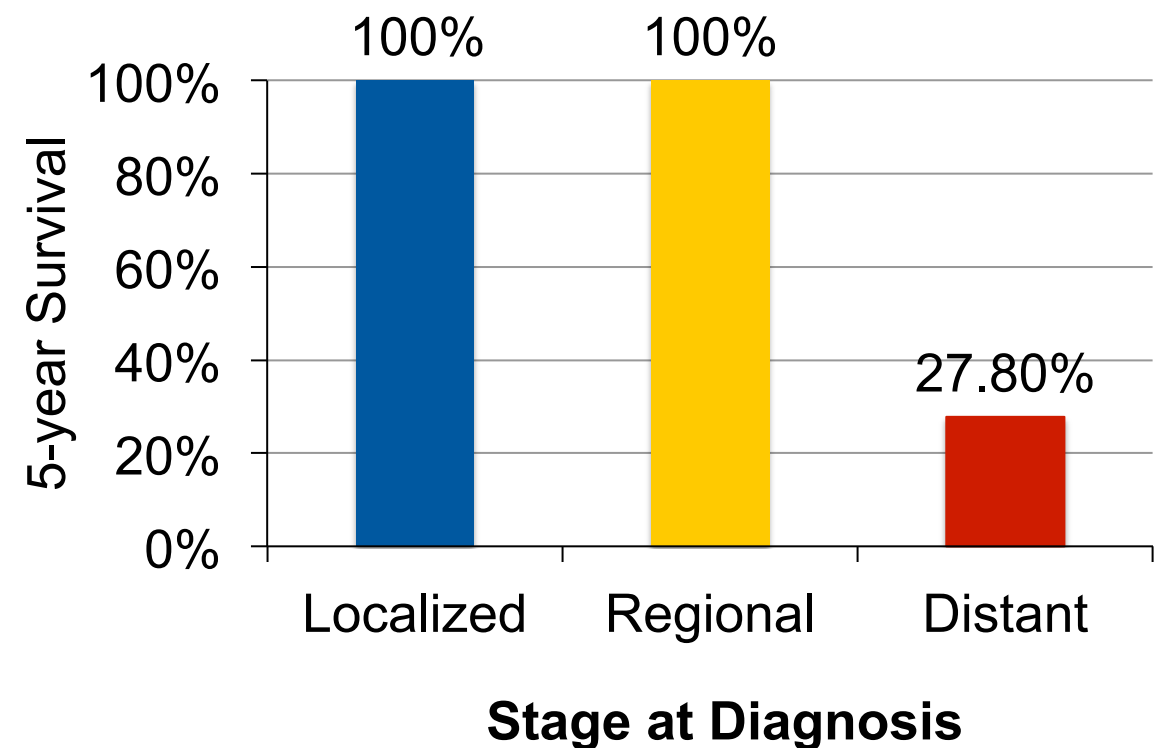
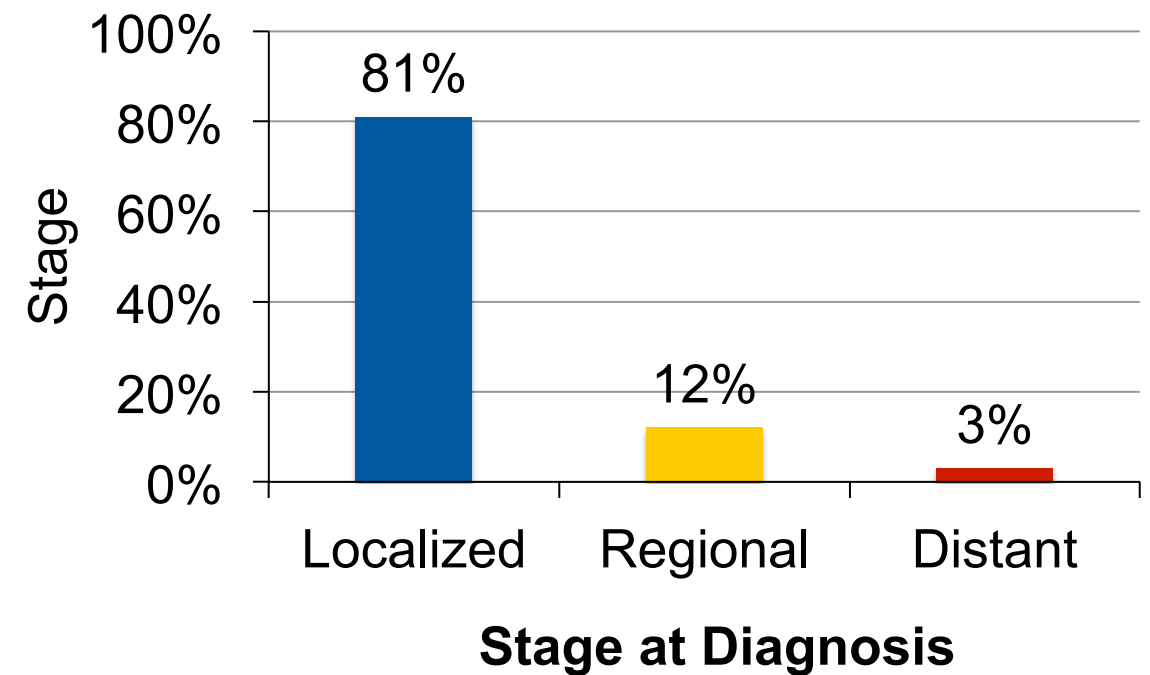
Prostate cancer incidence, mortality, and survivorship in US

Estimated New Cases*

Males		
Prostate	241,740	29%
Lung & bronchus	116,470	14%
Colon & rectum	73,420	9%
Urinary bladder	55,600	7%
Melanoma of the skin	44,250	5%
Kidney & renal pelvis	40,250	5%
Non-Hodgkin lymphoma	38,160	4%
Oral cavity & pharynx	28,540	3%
Leukemia	26,830	3%
Pancreas	22,090	3%
All Sites	848,170	100%

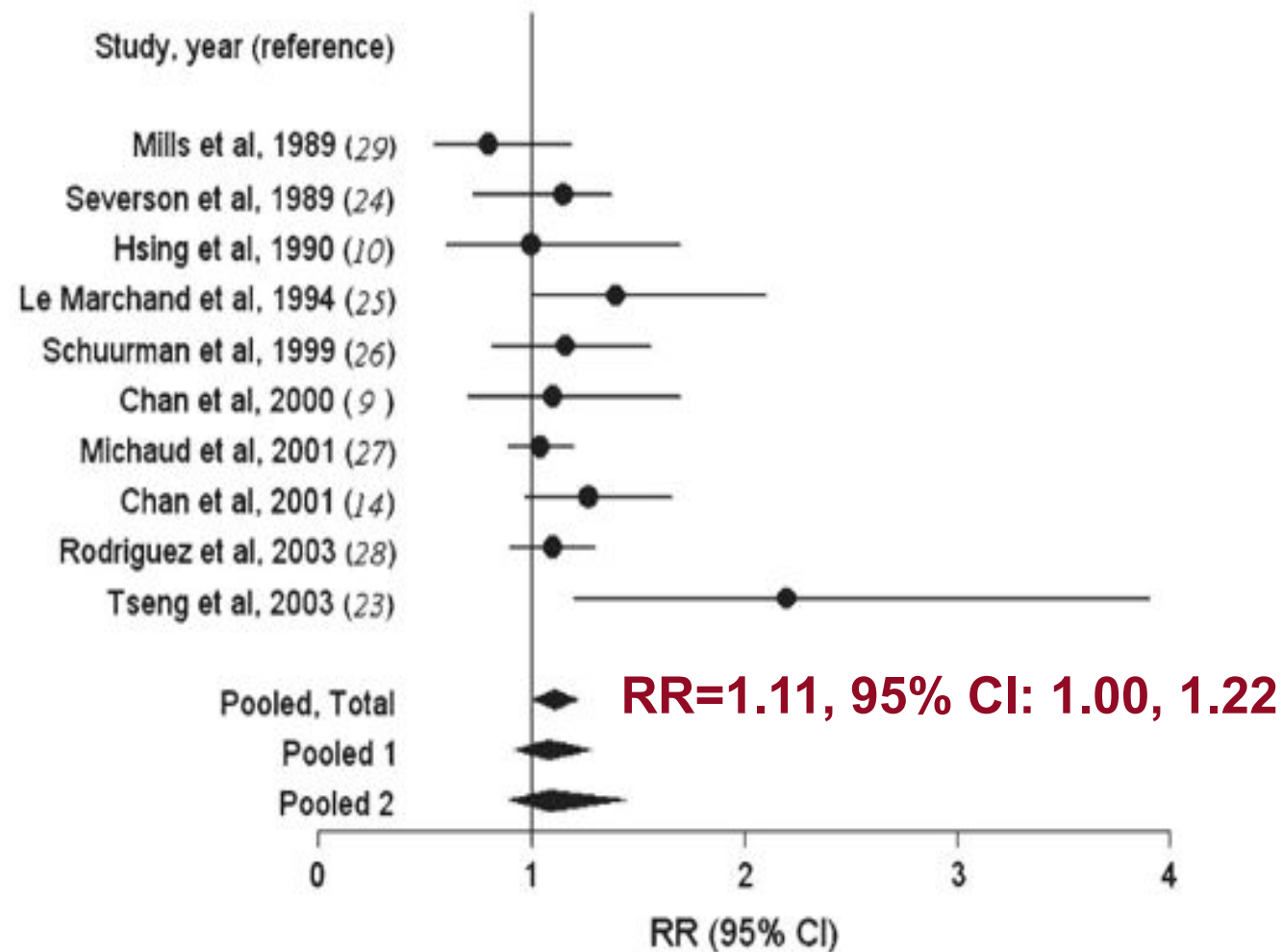
Estimated Deaths

Males		
Lung & bronchus	87,750	29%
Prostate	28,170	9%
Colon & rectum	26,470	9%
Pancreas	18,850	6%
Liver & intrahepatic bile duct	13,980	5%
Leukemia	13,500	4%
Esophagus	12,040	4%
Urinary bladder	10,510	3%
Non-Hodgkin lymphoma	10,320	3%
Kidney & renal pelvis	8,650	3%
All Sites	301,820	100%



A meta-analysis of the association of dairy food intakes with risk of incident prostate cancer

Meta-analysis #1



Gao et al. JNCI 2005

Meta-analysis #2

Cohort studies:

RR=1.06, 95% CI: 0.91, 1.23

Case-control studies:

RR=1.14, 95% CI: 1.00, 1.29

Limitations:

- Few evaluated different types of dairy foods with risk of prostate cancer
- Few considered advanced disease or prostate cancer-specific death as a major outcome

The Physicians' Health Study (PHS)

heart disease and cancer

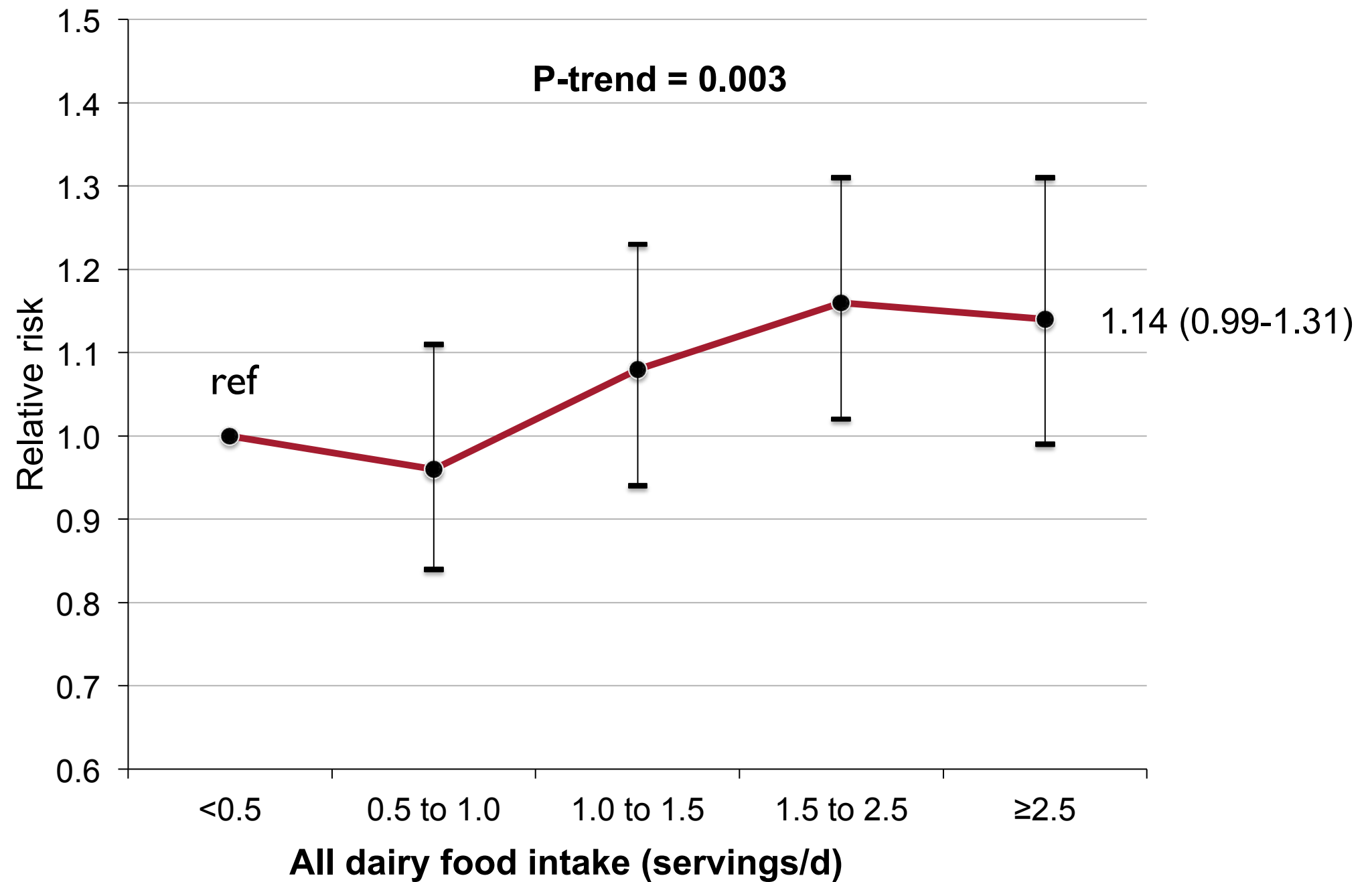
- 22,071 US male physicians, aged 40 to 84 in 1982
- Dietary assessment at enrollment, run-in, and 12-mo questionnaires
- Ascertainment of incident PCa and PCa mortality
- Used Cox proportional hazards regression models

	2+ /day	daily	5-6/wk
(13) Broccoli (½ c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) Brussels sprouts (½ c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) Carrots (whole or ½ c. cooked)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) Spinach, cooked (½ c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(17) Spinach/dark green lettuce salad (exclude iceberg)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(18) Yellow squash (½ c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(19) Yams or sweet potatoes (½ c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(20) Tomato juice (small glass)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(21) Tomatoes (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(22) Orange juice (small glass)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(23) Cantaloupe (¼ melon)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(24) Peaches, apricots or nectarines (fresh, frozen or canned)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(25) Dried apricots (½ c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(26) Liver (3-4 oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(27) Cold breakfast cereal (1 c.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(28) Eggs (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(29) Whole milk (8 oz. glasses)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(30) Skim or low fat milk (8 oz. glasses)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(31) Red chili sauce (1 tablespoon)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

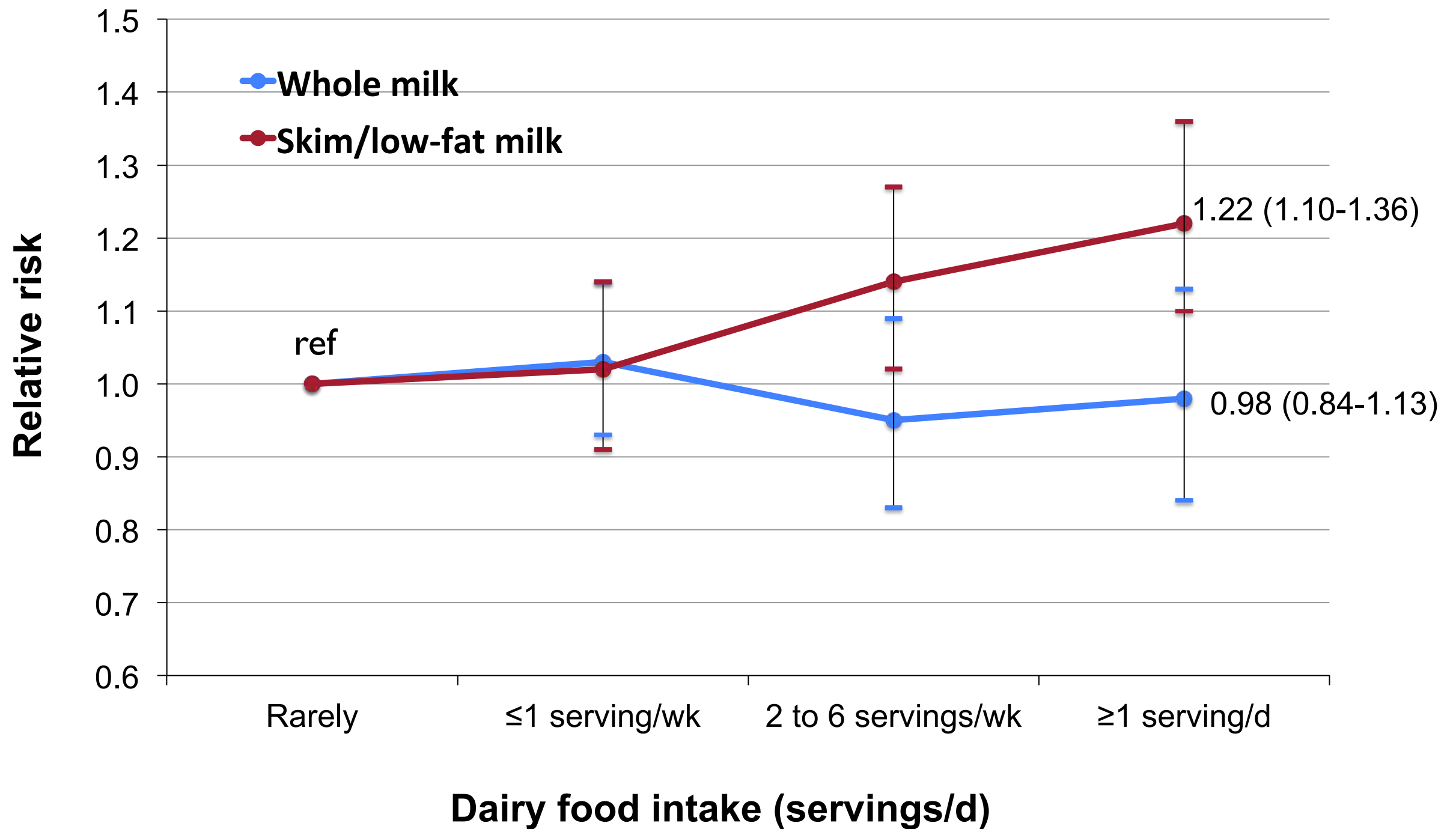
9. Please indicate how often, on average, you have eaten each of the following 1

	2+ /day	daily	5-6/wk
(1) Chicken or turkey (6-8 oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) Hot dogs (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) Beef, pork or lamb as a sandwich or mixed dish (hamburger, stew, casserole, lasagne, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) Beef, pork or lamb as a main dish (steak, roast, ham, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) Canned tuna fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) Dark meat fish — e.g. mackerel, salmon, sardines, bluefish, swordfish (4-6oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(7) Other fish (4-6 oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(8) Shrimp, lobster, scallops as a main dish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(9) Hard cheese (e.g. American, cheddar) (1 slice or 1 oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(10) Ice cream (1 cup)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(11) Cookies (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(12) Potato chips, corn chips (1 oz. or small bag)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(13) Peanut butter (1 tbl.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(14) Nuts (small packet or 1 oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(15) French fried potatoes (4 oz.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(16) Fried food of any type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RR of incident prostate cancer by intake of dairy food, PHS

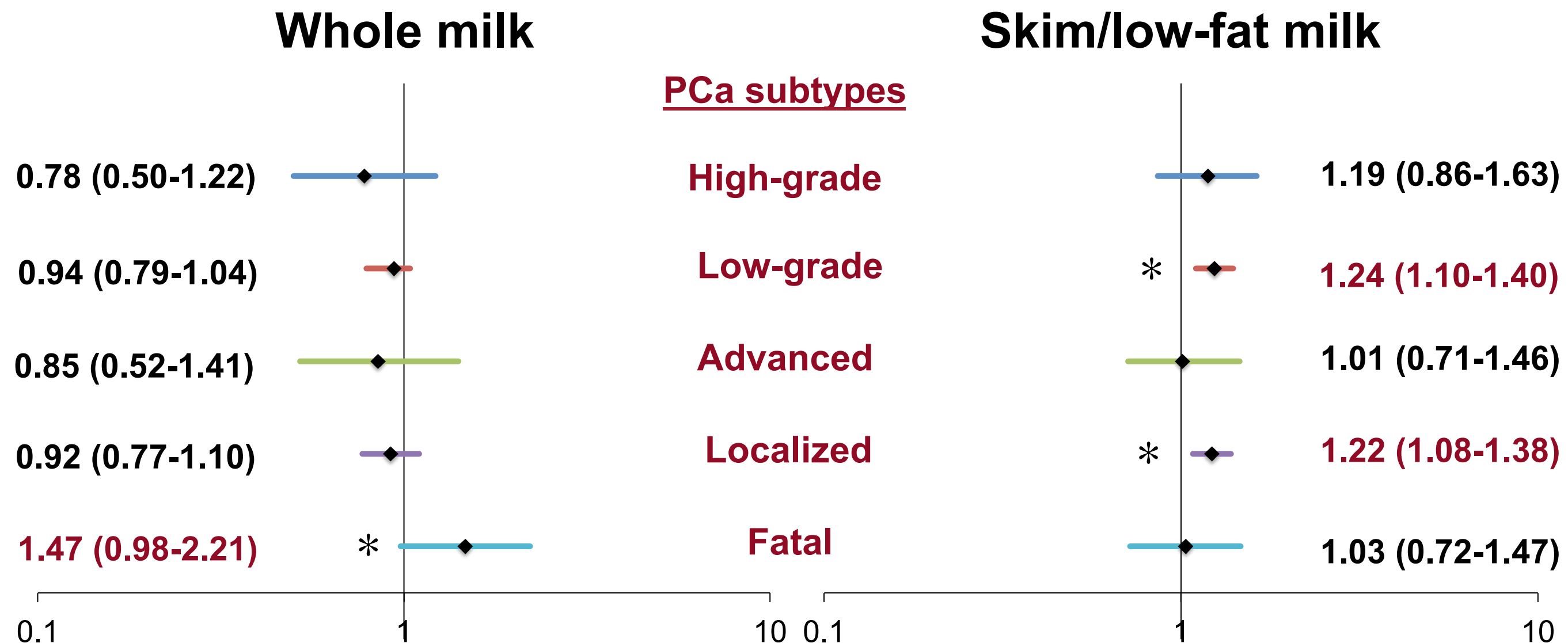


RR of incident prostate cancer by intake of whole milk and skim/low-fat milk, PHS



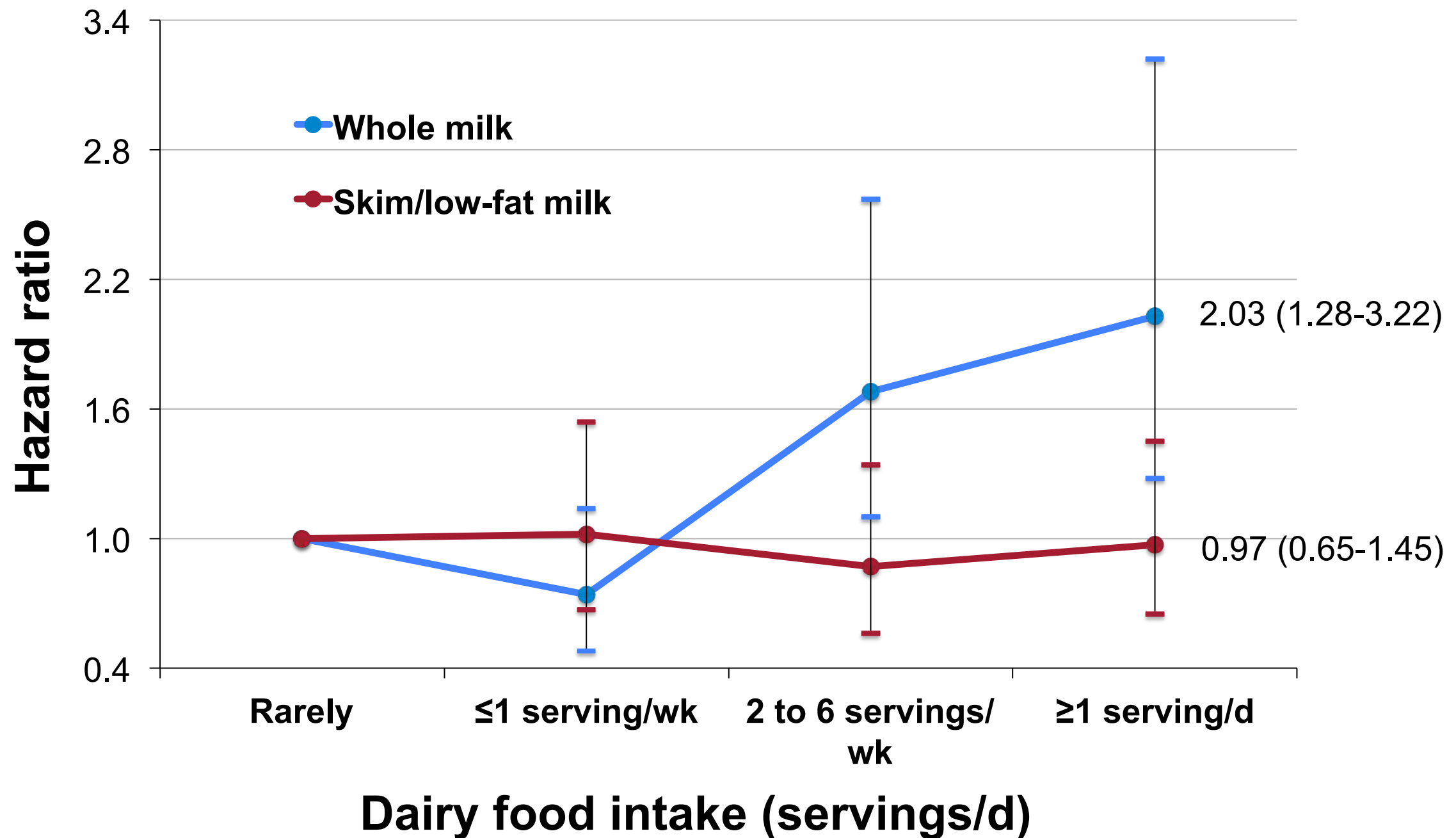
*Covariates adjusted: age, cigarette smoking, vigorous exercise, alcohol, race/ethnicity, BMI, baseline diabetes status, red meat consumption, and mutually adjusted for intake levels of each other.

RR of incident prostate cancer by intake of whole milk and skim/low-fat milk and Stratified by subtypes of disease, PHS



*High-grade (n = 317): Gleason > 7; Low-grade (n = 2105): Gleason ≤ 7; Advanced (n = 272): T3/T4/N1/M1; Localized (n = 2016): T1/T2; Fatal (n = 305): died of prostate cancer.

Risk of prostate cancer-specific mortality by pre-diagnostic intake of whole milk and skim/low-fat milk in prostate cancer cases, PHS



*Covariates adjusted: age, cigarette smoking, vigorous exercise, alcohol, race/ethnicity, BMI, baseline diabetes status, red meat consumption, Gleason score, stage of tumor, and mutually adjusted for intake levels of each other.

Conclusions

- Dairy product intake was associated with PCa risk.
- Skim/low-fat milk intake was associated with PCa risk, primarily with low-grade and early stage tumors.
- Whole milk intake was associated with fatal PCa risk and fatality after diagnosis.



Acknowledgement

Jing Ma

Jorge E. Chavarro

Yin Cao

Weiliang Qiu

Lorelei Mucci

Howard D. Sesso

Meir J. Stampfer

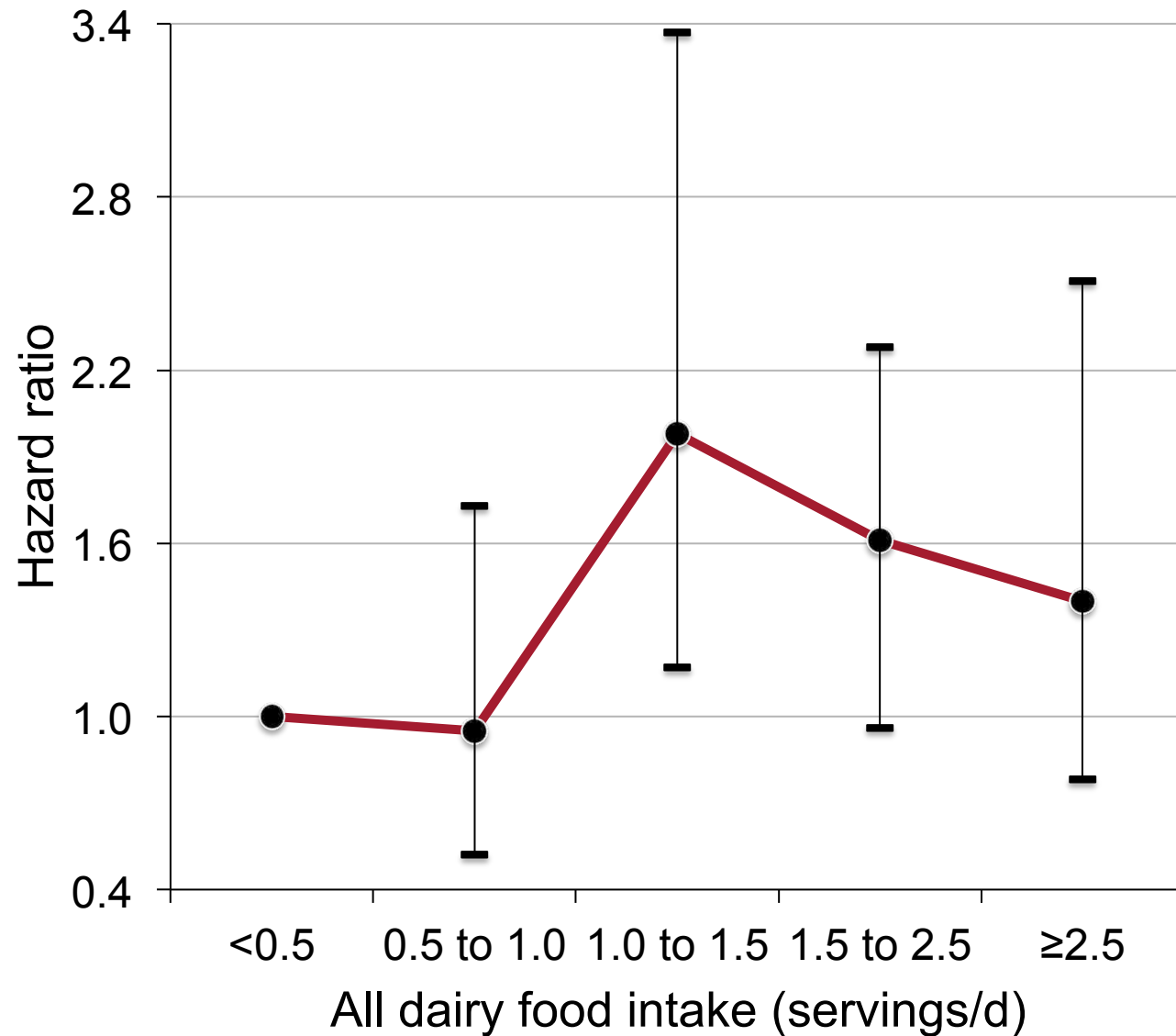
Edward Giovannucci

Michael Pollak

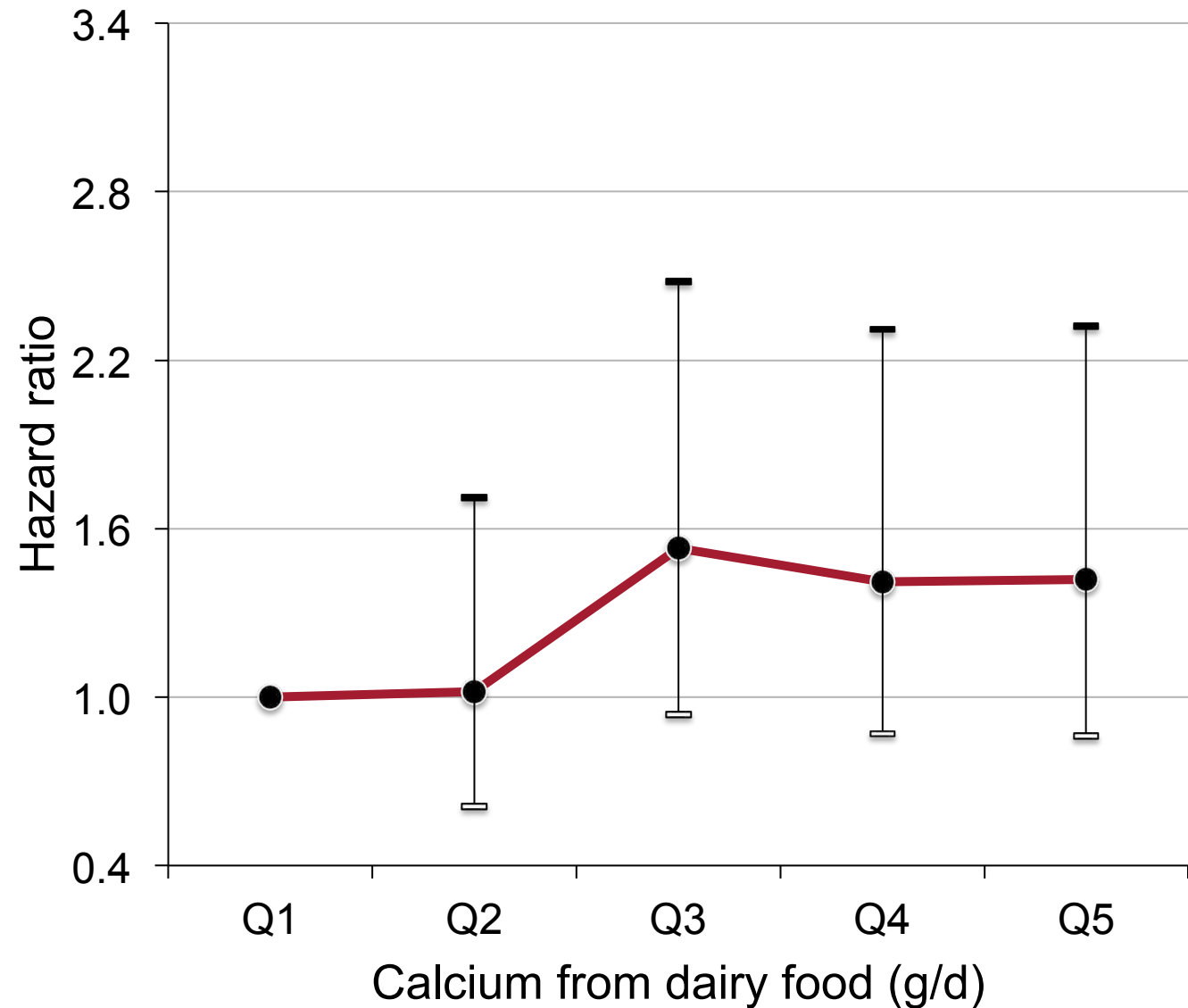
Simin Liu

- This project has been funded by CA42182, CA141298, CA131945, CA097193, the Transdisciplinary Research in Energetics and Cancer Center (TREC) U54CA155626 from the National Institutes of Health, and the National Cancer Institute of Canada (019894).
- Yan Song is also supported by the UCLA Burroughs Wellcome Fund Inter-school Training Program in Metabolic Diseases (BWF-IT-MD).

HR of prostate cancer death by pre-diagnostic intake of dairy product and dairy calcium in prostate cancer cases, PHS



HR=1.40, 95% CI: 0.78, 2.51
(Highest vs. lowest group)



HR=1.47, 95% CI: 0.96, 2.25
(Q5 vs. Q1)

Table 1. Baseline characteristics by category of baseline dairy product intake (*n* = 21,660)

	Dairy products ^a		Whole milk		Skim/low-fat milk	
	<0.5	≥2.5	≤1/wk	≥2/wk	≤1/wk	≥2/wk
Age (y)	52.3	55.1	53.0	55.5	53.4	53.6
BMI (%)						
Normal	56	56	58	56	57	59
Overweight	40	35	38	39	39	37
Obese	4	9	4	4	4	4
White (%)	85	96	93	89	90	95
Diabetes (%)	1.6	2.6	1.7	2.6	1.6	2.3

^a Based on the consumption of five major dairy foods (whole milk, skim/low-fat milk, hard cheese, ice cream, and cold breakfast cereal), assessed in 1982 to 1984.

Table 1. Baseline characteristics by category of baseline dairy product intake ($n = 21,660$)

	Dairy product ^a		Whole milk		Skim/low-fat milk	
	<0.5	≥2.5	≤1/wk	≥2/wk	≤1/wk	≥2/wk
Smoking (%)						
Never	46	61	51	48	48	54
Former	41	35	40	37	41	37
Current	13	4	9	15	12	8
Alcohol (%) ^b	29	20	24	24	26	21
Exercise (%) ^c	48	59	55	50	51	58
Red meat (srv/wk)	0.6	0.8	0.7	0.8	0.7	0.7

^a Based on the consumption of five major dairy foods (whole milk, skim/low-fat milk, hard cheese, ice cream, and cold breakfast cereal), assessed in 1982 to 1984.

^b Frequent drinker is defined as people who drink alcoholic beverages every day.

^c Vigorous exercise is defined as to exercise vigorously to a sweat more than twice per week.

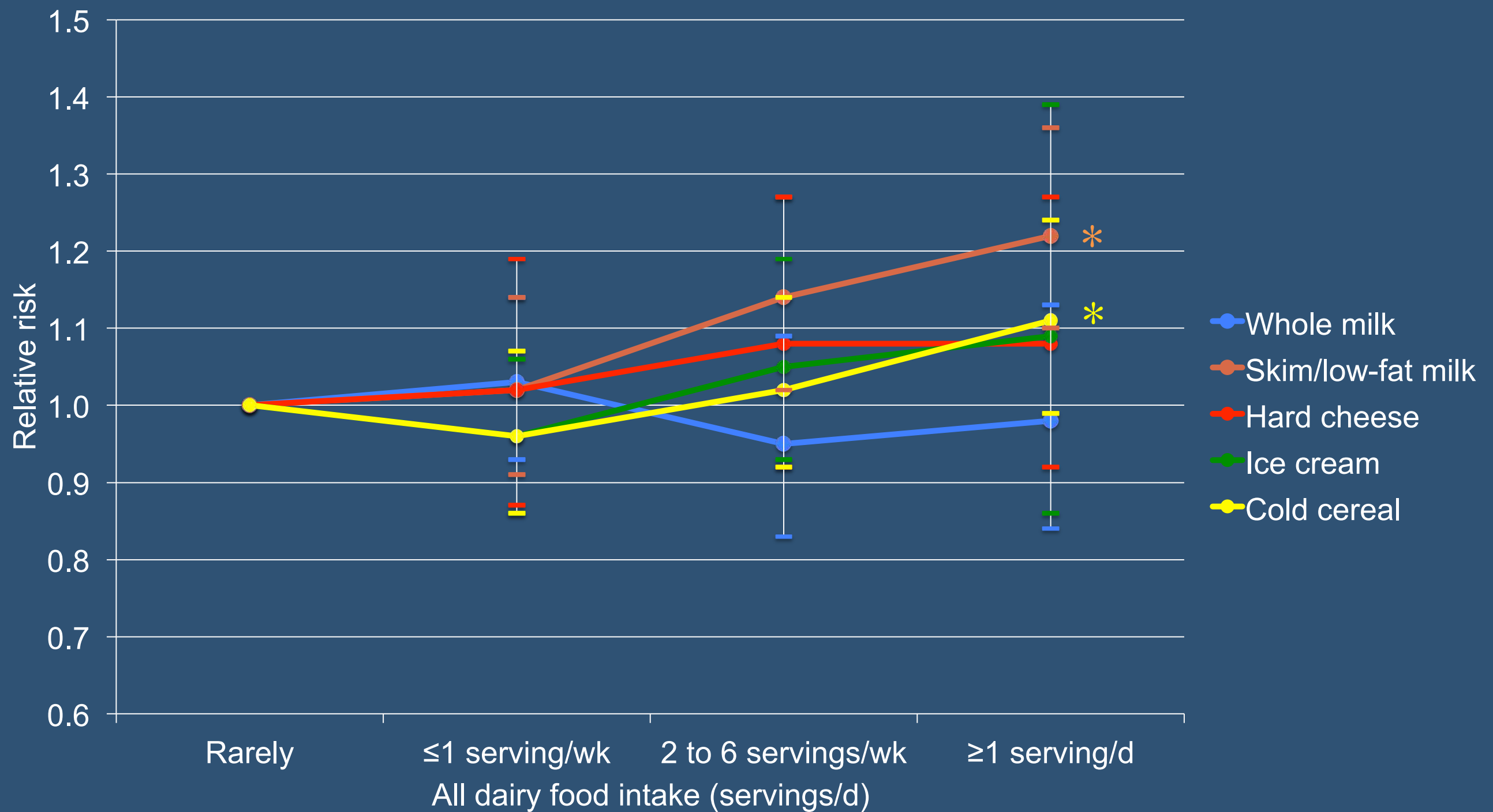


Figure 2. Relative risk estimates for prostate cancer by intake of different dairy products in PHS

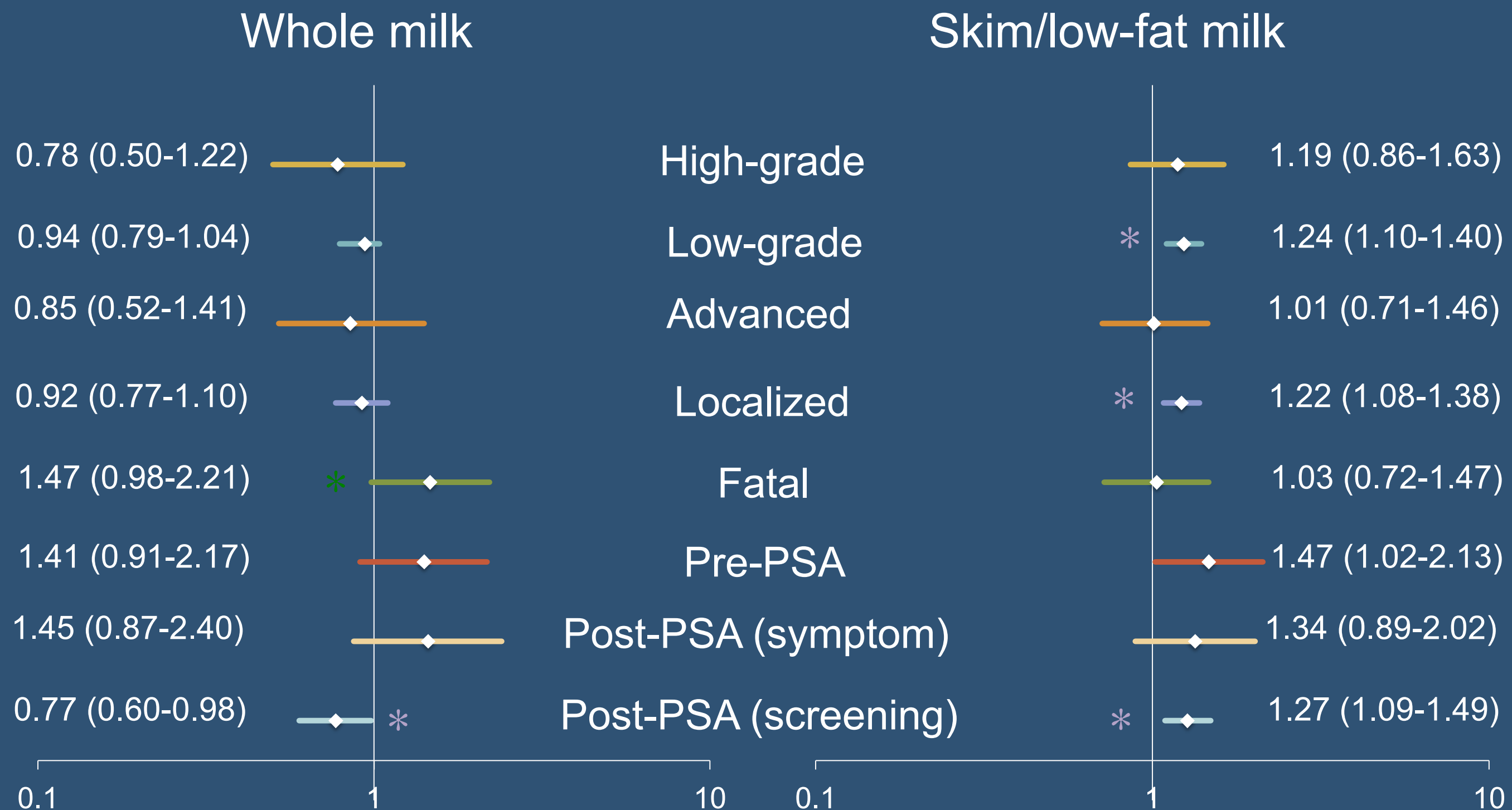


Figure 3. Multivariate relative risk estimates for categories of prostate cancer cases by intake of dairy product in PHS

Difference between whole milk and skim milk

Nutrient	Unit	Whole/Skim	Difference in 8 oz.	% of DRI
Total fat	g	41:1	7.2	11%
SFA	g	37:1	4.1	20%
MUFA	g	39:1	1.8	n/a
PUFA	g	65:1	0.4	n/a
Cholesterol	mg	5:1	18.1	6%
Vitamin A	IU	11:1	332	7%
Vitamin D	IU	>100:1	4.5	1%
Vitamin E	mg	7:1	0.1	0.9%
Vitamin K	μg	>100:1	0.7	0.6%
Se	μg	1.2:1	1.4	2%
Cu	mg	2:1	0.03	3%
Zn	mg	1:1.1	0.1	1%
P	mg	1:1.2	38.4	5%
K	mg	1:1.2	54.2	1%
Betaine	mg	1:3	2.9	n/a