Nordic diet

and risk of cancer, type 2 diabetes and heart disease




Pictures: Colourbox

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ICDM, Seoul, Saturday September 30, 2017

Conflicts of interests

I have no conflicts of interests to report in relation to this presentation

About me

- Nutritional and cancer epidemiologist
- Danish Cancer Society Research Center
- International Agency for Research on Cancer (IARC), World Health Organization (WHO)

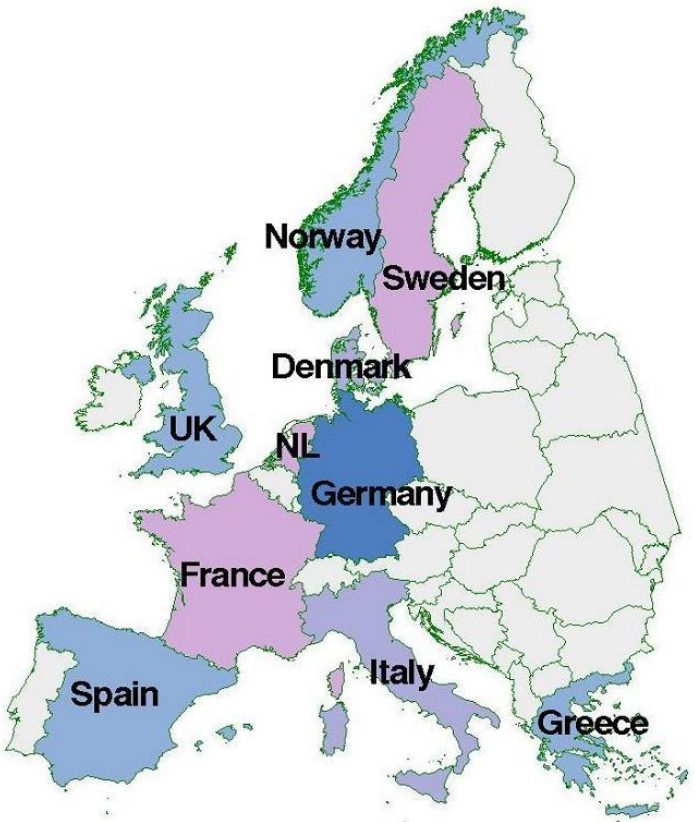
Research - Cohort studies

- European cohort: *The European Prospective Investigation into Cancer and Nutrition* (EPIC) (n=500,000)
- Danish cohort (Danish part of EPIC): *Diet, Cancer and Health* (n=57,053)

Why study the Nordic diet?

The European Prospective Investigation into Cancer and Nutrition (**EPIC**)

- 500,000 European participants
  - Biological specimens from 385,000 of participants
- Baseline mid 1990's



*Riboli, E., et al. (2002), Public Health Nutr. **5**(6B): 1113-1124*

Regional diets – results from the EPIC cohort

Country	Foods consumed ≥ 150% mean
Italy	Vegetables, fruits, cereal products, vegetable oils, sauces
Greece	Vegetables, legumes, vegetable oils
Spain	Vegetables, fruits, legumes, vegetable oils, milk, eggs, fresh meat, fish
France	Sugar, butter, dairy products
Germany	Butter processed meat, coffee, juices
The Netherlands	Potatoes, margarines, dairy products, processed meat, tea, coffee
United Kingdom	Potatoes, cakes, sugar, margarine, butter, tea, soft drinks
Denmark	Sugar, margarine, tea, coffee, soft drinks, alcohol
Sweden, Norway	Potatoes, cakes, sugar, margarine, dairy products, coffee, soft drinks

Slimani et al, 2002, Public Health Nutrition

Construction of dietary index

Picture: Colourbox

1 point per intake above/below the sex-specific median intake

Above:

- High MUFA/SFA
- Moderate alcohol
- Legumes
- Grains (originally whole grains)
- Fruit
- Vegetables
- Dairy products (in moderation)

Below:

- Meat/meat products

BMJ

RESEARCH

Adherence to Mediterranean diet and health status: meta-analysis

Francesco Sofi, researcher in clinical nutrition,[1,2,5] Francesca Cesari, researcher,[1] Rosanna Abbate, full professor of internal medicine,[1,5] Gian Franco Gensini, full professor of internal medicine,[3] Alessandro Casini, associate professor of clinical nutrition[2,4,5]

Conclusions Greater adherence to a Mediterranean diet is associated with a significant improvement in health status, as seen by a significant reduction in overall mortality (9%), mortality from cardiovascular diseases (9%), incidence of or mortality from cancer (6%), and incidence of Parkinson's disease and Alzheimer's disease (13%). These results seem to be clinically relevant for public health, in particular for encouraging a Mediterranean-like dietary pattern for primary prevention of major chronic diseases.

Sofi et al., BMJ. 2008;337:a1344.

Mediterranean diet

- in non-mediterranean countries

- Compliance to ”foreign” diet may be difficult (possible especially for lower socioeconomic status)
- Risk of replacement of healthy traditional foods with less healthy foods?
- Cultural diversity and heritage?
- Sustainability?

Healthy regional diets

Short communication

Is the term 'Mediterranean diet' a misnomer?

Elling Bere[1,*] and Johannes Brug[2]

[1]Faculty of Health and Sport, Serviceboks 422, University of Agder, 4604 Kristiansand, Norway:
[2]EMGO Institute for Health and Care Research, VU University Medical Center, Amsterdam, The Netherlands

Conclusions: We argue that the evidence of the health-enhancing properties of the Mediterranean diet is not necessarily based on Mediterranean foods, and that we indeed do not have to eat Mediterranean foods to enjoy the health-promoting properties of the diet it represents. To maintain dietary variety, cultural diversity and heritage, as well as for environmental reasons, it seems more appropriate to promote regionally appropriate diets throughout the world – rather than a global Mediterranean diet.

Bere & Burg, Public Health Nutrition, 2010, 13(12), 2127–2129

Healthy Nordic foods?

- Whole grains are eaten in higher amounts in the Nordic countries than in most other western societies
- Evidence for beneficial effects of whole grain is accumulating
- *Does the Nordic diet contain other foods with potential health promoting effects?*

Pictures: Colourbox

Methods

Criteria for inclusion into the **Healthy Nordic Food index**

1. Originating from the Nordic nature
2. A quantitative role in the daily Nordic diet, both in the (near) past and currently
3. Ascribed beneficial health effects
4. Information obtainable

Olsen et al. (2011). J.Nutr. 141(4): 639-644.

Health effects of a Nordic diet

Vitamins, antioxidants, n-3 fatty acids

CVD, inflammatory markers

Phytoestrogens, dietary fibre, vitamins, minerals, antioxidants

Diabetes, CVD, colorectal cancer

Polyphenols, vitamin K, n-3 fatty acids, antioxidants, dietary fiber, carotenoids

Cancer

N-3 fatty acids, vitamin D, Selenium

Prevention of stroke, Reduced blood pressure, Anti-inflammatory

Dietary fiber, Beta-carotene

Cancer

Vitamins, minerals, polyphenols, dietary fibers,

CVD, to some extent cancer

Pictures: Colourbox

Methods

The Diet, Cancer and Health cohort

Study population:

- 57,053 men and women
- 50–64 years at baseline (1993-1997)
- Information about diet and lifestyle from questionnaires
- Biological samples (blood fractions, urine, toenail clippings, adipose tissue)

A healthy Nordic food index

Food items included:

- Rye bread
- Oatmeal
- Cabbages
- Fish
- Apples and pears
- Root vegetables

- Berries
- Shellfish
- Rapeseed oil

Foods included in the healthy Nordic food index

Food item	grams per day*
Fish	≥41/35
Root vegetables	≥16/29
Rye bread	≥63
Oatmeal	≥21
Apples and pears	≥56/71
Cabbages	≥15/16

* Men/Women

- Intake above the sex-specific cut-off (median) = 1 point

Index with values from:

- 0 points (lowest) – 6 points (highest)

Methods

57,053 men and women

- *4,126 deaths*
- *1,025 colorectal cancer*
- *7,366 type 2 diabetes*
- *2,322 myocardial infarction*

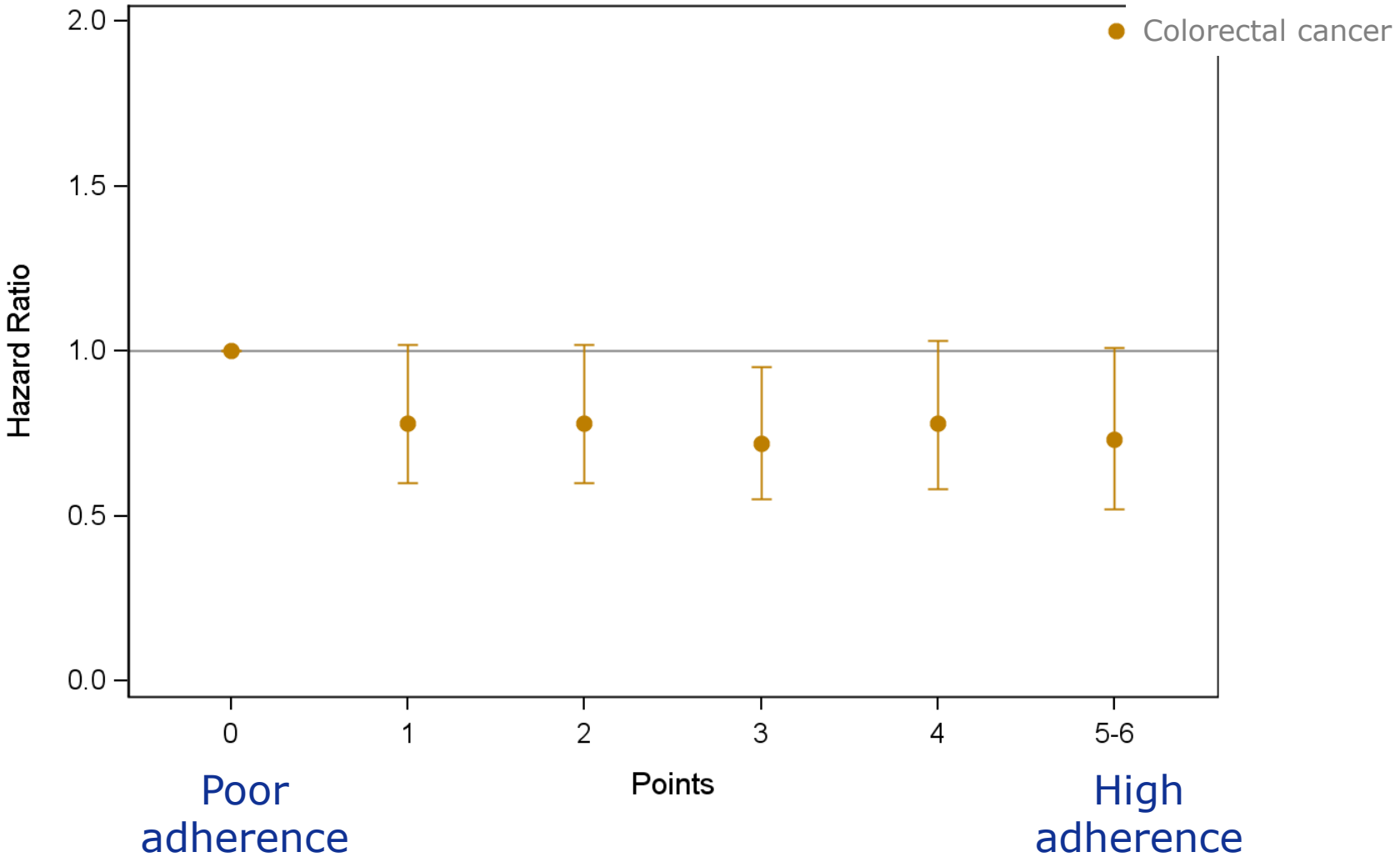
Baseline
1993–1997

End of follow-up
2008-2011

Median follow-up time:
12-15 y

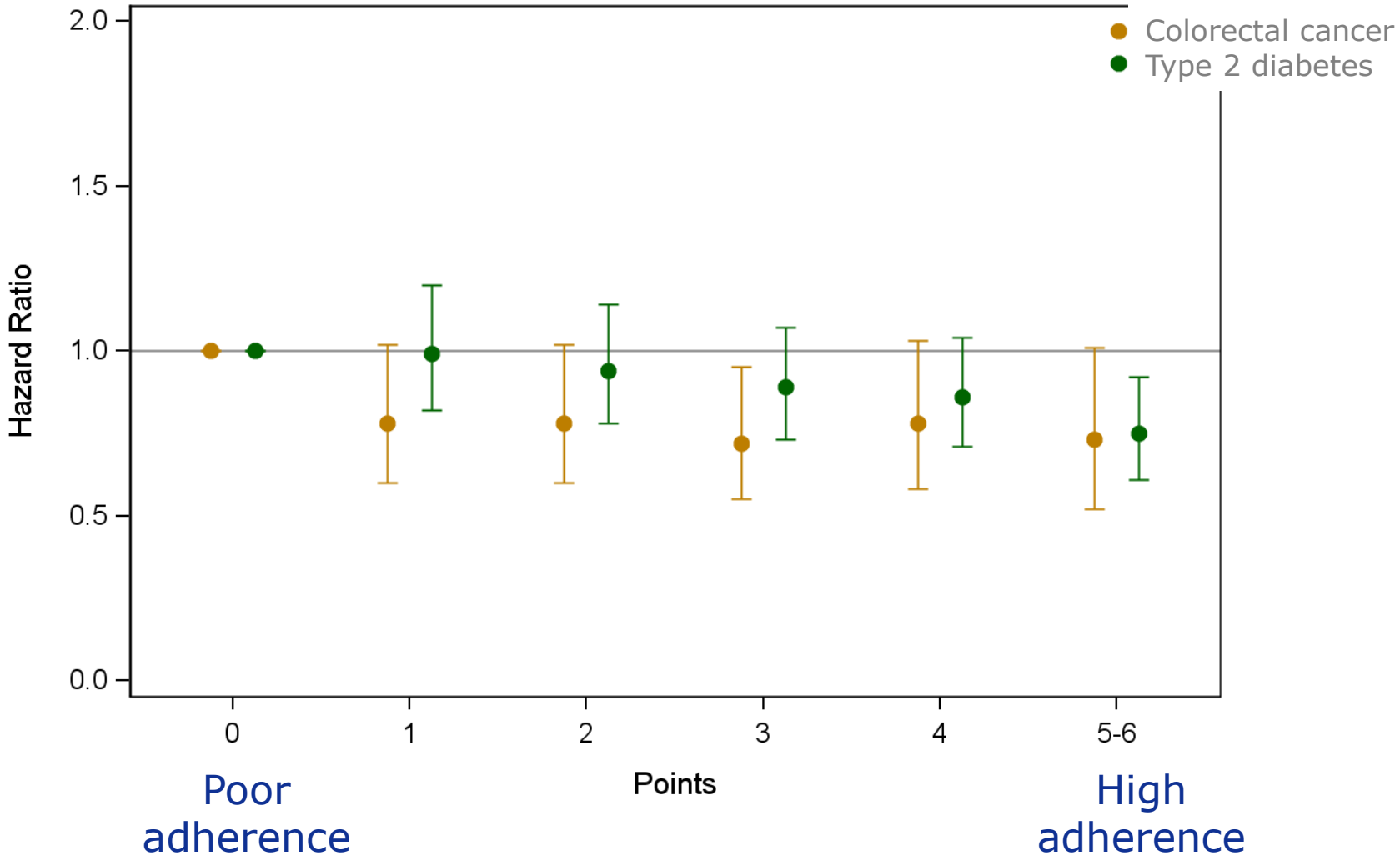
Results

Women



Kyro et al. (2013). Br.J.Nutr. 109(5): 920-927.

Women



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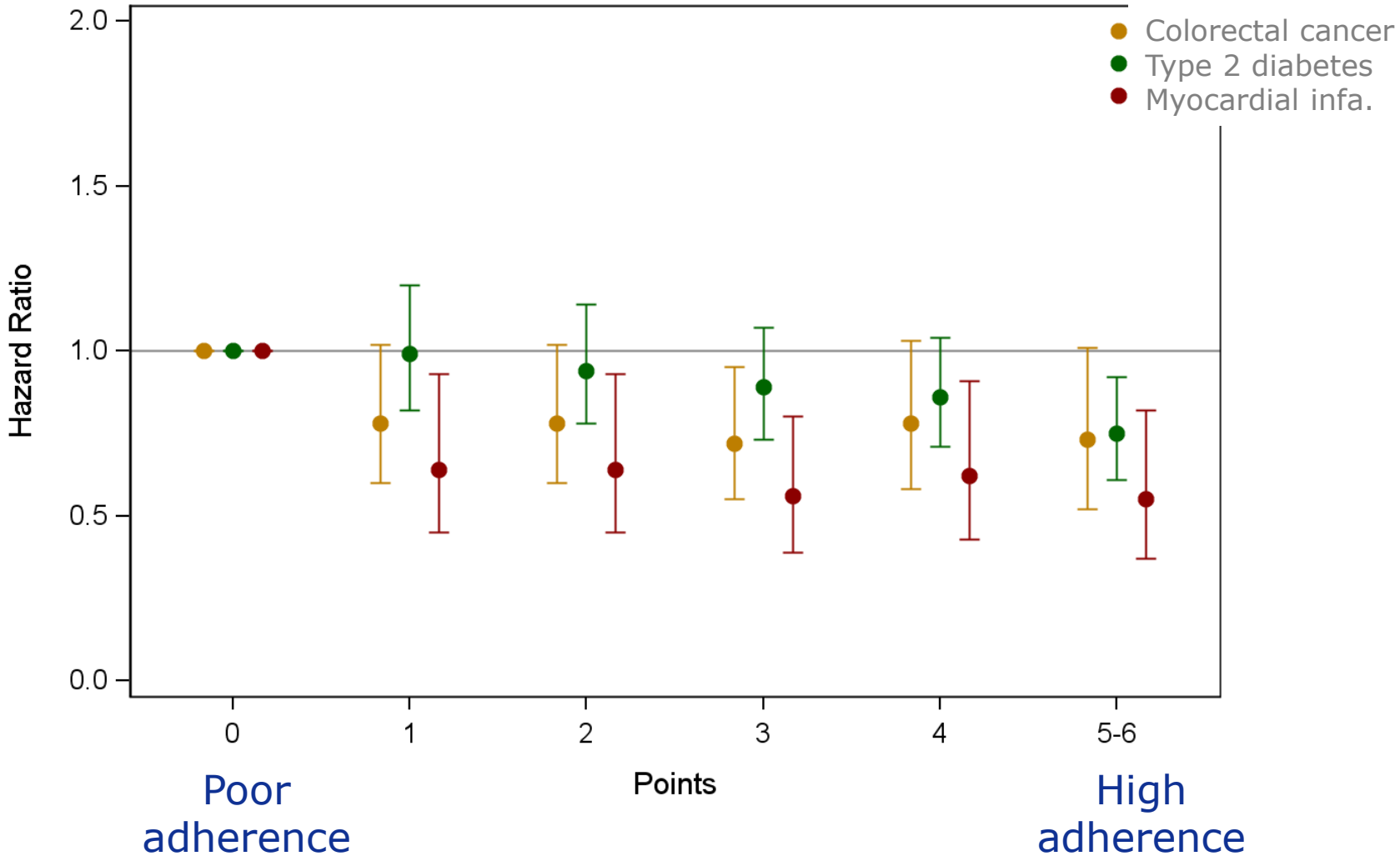

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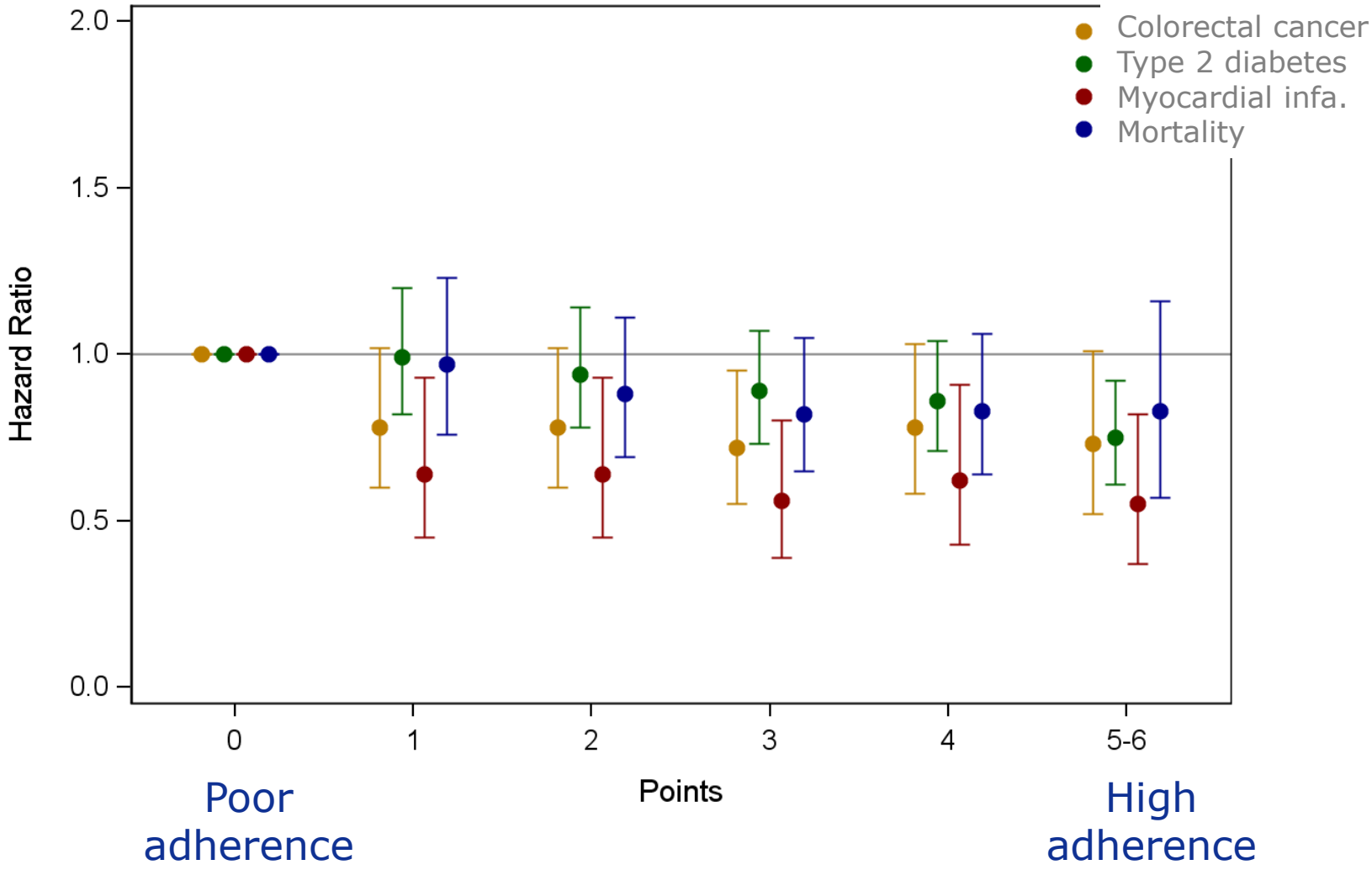
Women



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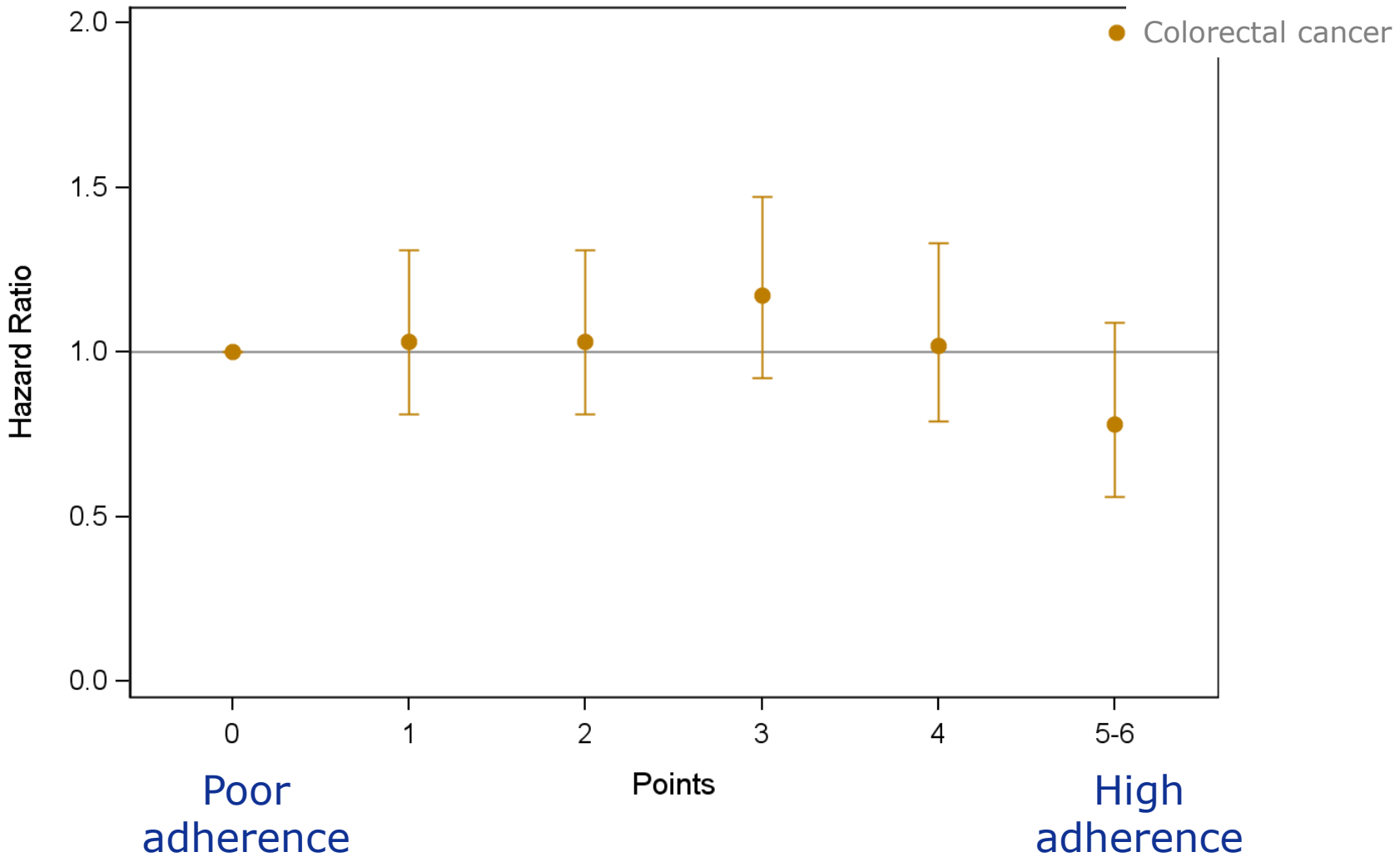
Men



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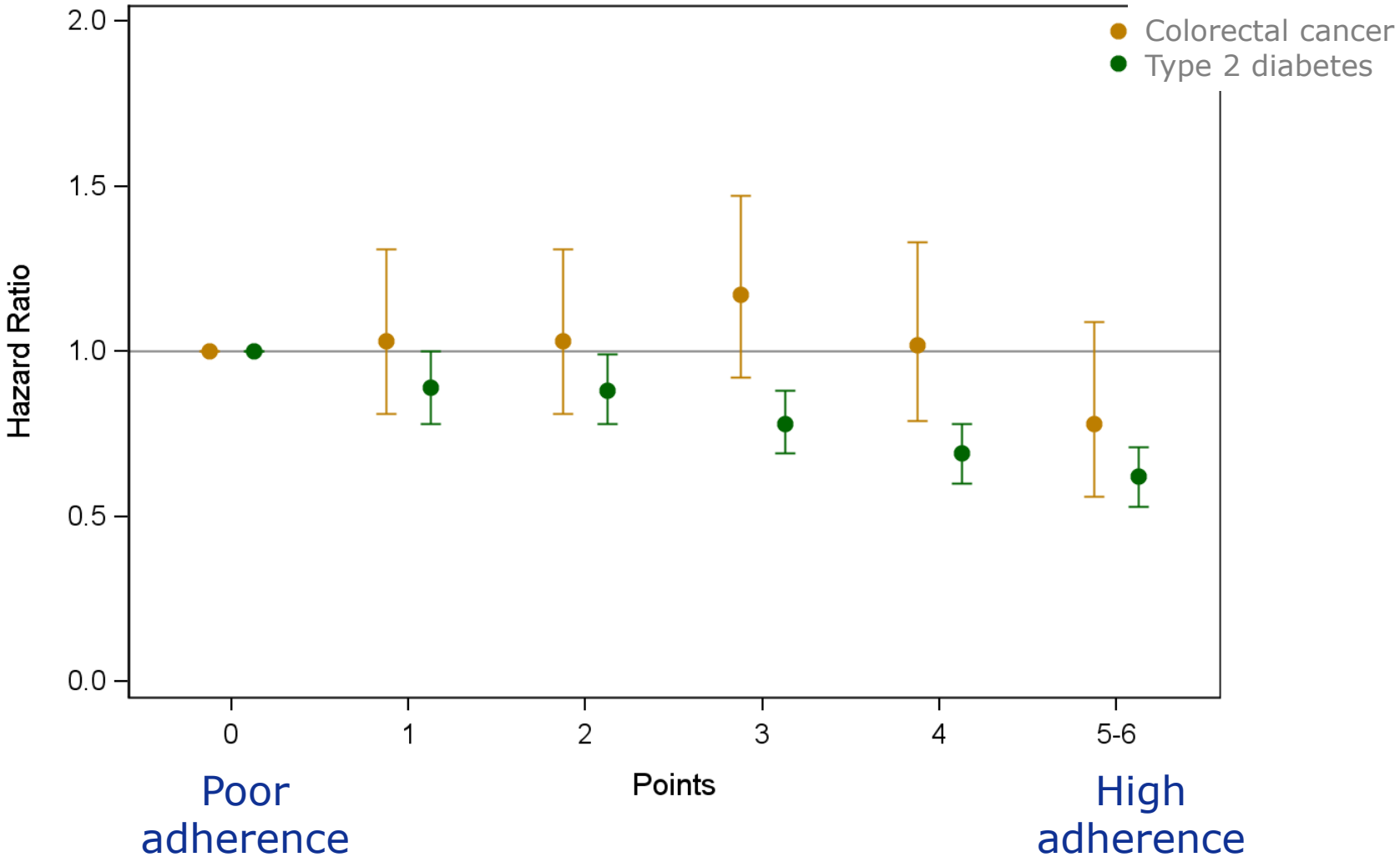

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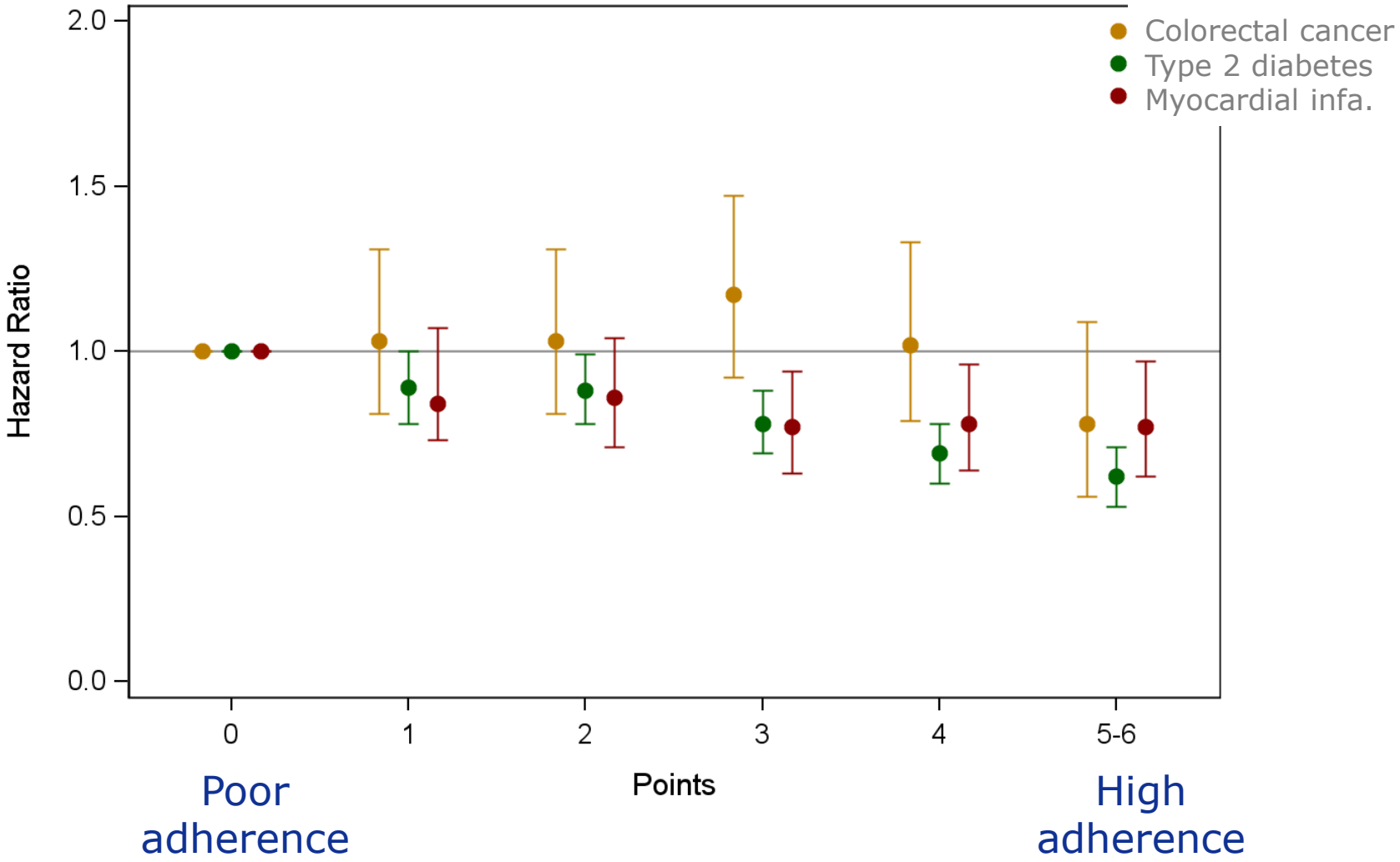

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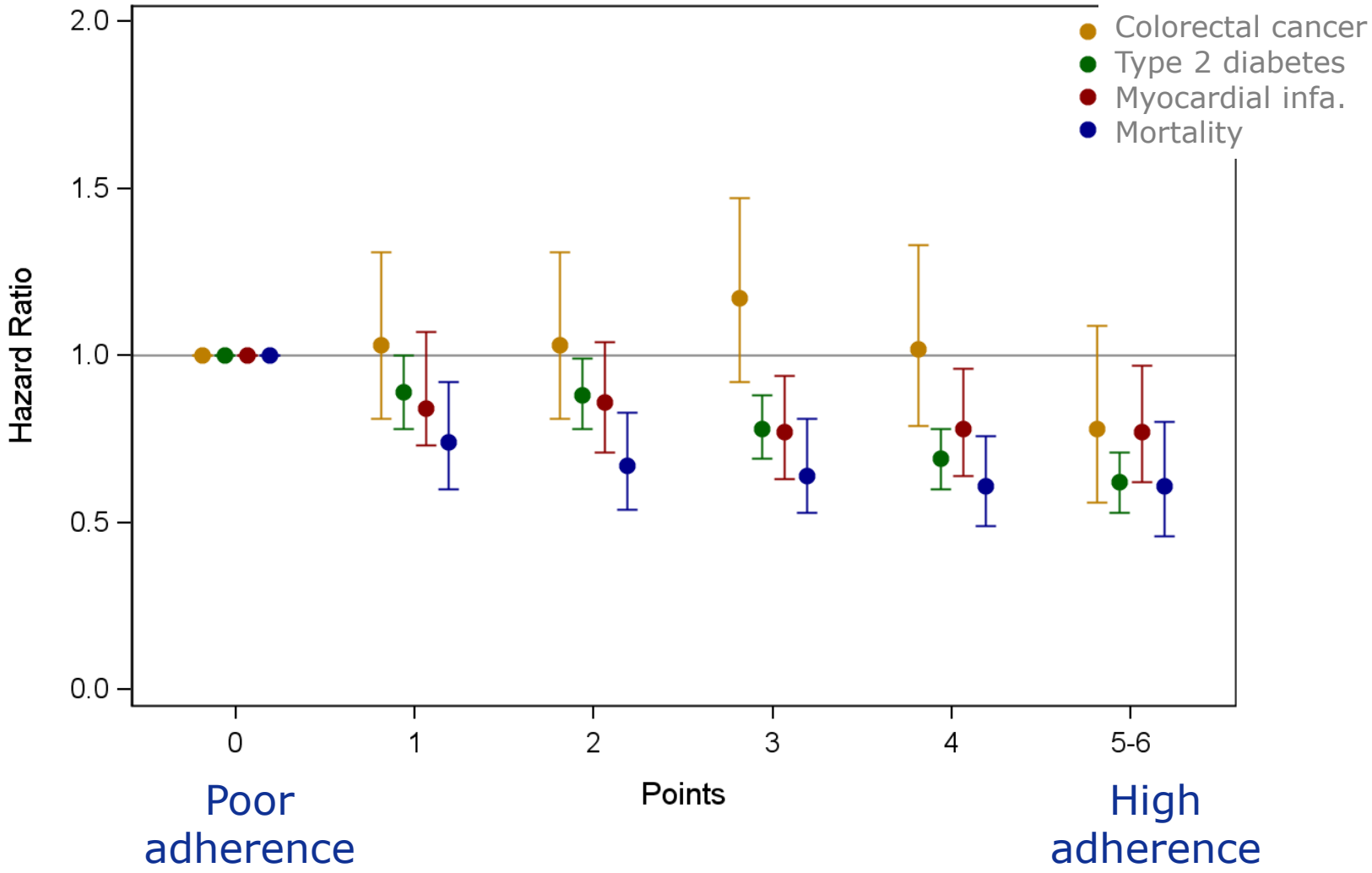

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Discussion and perspectives

Public health relevance

- Adherence to the index seems to be associated with health!
- Lowering in risk comparable to previously reported studies of the Mediterranean food index

Food culture

- Is it easier to increase intake of well known foods than to adopt to more unfamiliar dietary habits?
- Maybe especially for those most reluctant to dietary changes?

Nordic foods for the world?

- Some of the foods relevant in worldwide perspective?

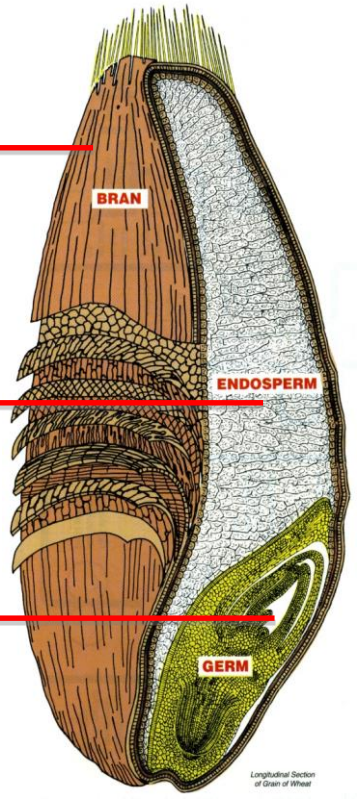
Whole grains

What are whole grains?

Bran:
- B vitamins
- Phytochemicals
- Protein
- Dietary fiber
- Alkylresorcinols

Endosperm:
- Protein
- Carbohydrates

Germ:
- B vitamins
- Polyunsaturated fatty acids
- Phytochemicals
- Vitamin E
- Minerals



Whole grains and health

- possible mechanisms

Fermentable fiber:

- Production of SCFA – butyrate
- Anti-carcinogen
- Drop in pH → decrease in formation of secondary bile acids

Non-fermentable fiber:

- "mechanical" effects
- Faster transit time

Lignans → enterolactone

Folate – deficiency → DNA damages

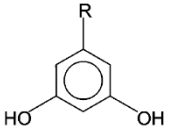
Weight management?

Glucose/insulin homeostasis

Alkylresorcinols

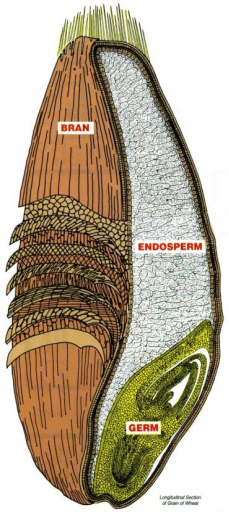
- Biomarkers of whole-grain intake

- Phenolic lipids – found in the bran part of rye and wheat
- Unaffected by food processing
- Validated (measured in plasma) both in intervention studies and in cohort studies
  - Questionnaire vs. biomarker: r=0.25–0.57



Alkylresorcinol	Abbreviation used	R	Molecular weight (g/mole)
5-n-Heptadecylresorcinol	(C17:0)	$C_{17}H_{35}$	348
5-n-Nonadecylresorcinol	(C19:0)	$C_{19}H_{39}$	376
5-n-Heneicosylresorcinol	(C21:0)	$C_{21}H_{43}$	404
5-n-Tricosylresorcinol	(C23:0)	$C_{23}H_{47}$	432
5-n-Pentacosylresorcinol	(C25:0)	$C_{25}H_{51}$	460

Figure 1. Structures of alkylresorcinols (ARs) commonly found in cereals.



Research projects - methods

Questionnaire data

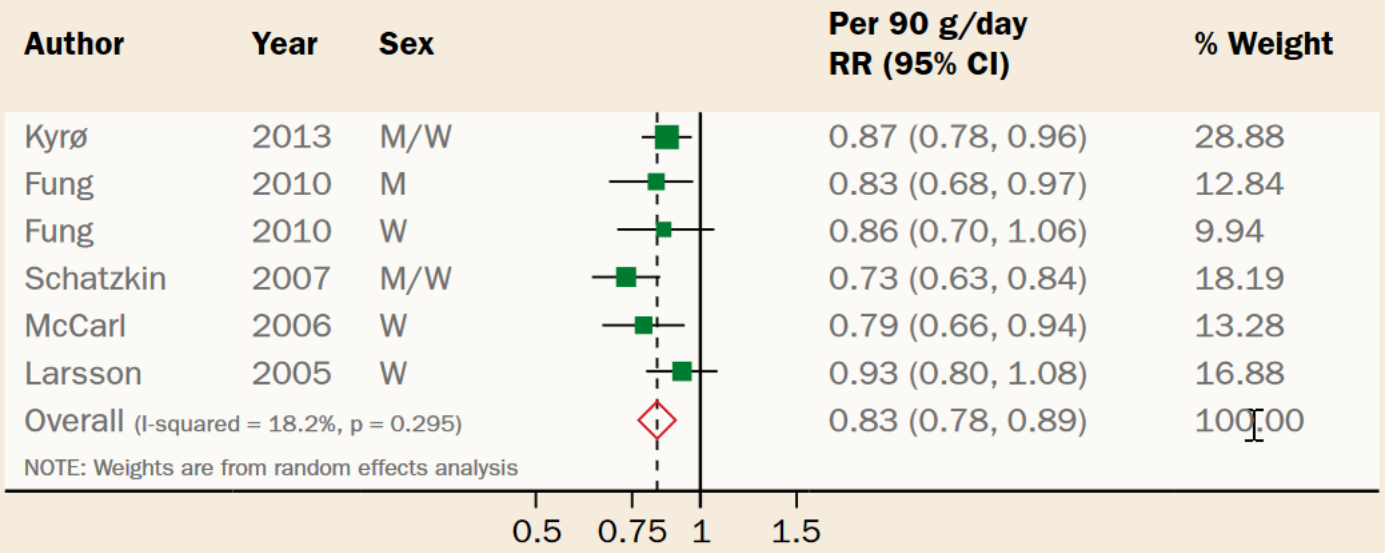
- Colorectal cancer (1100 cases)
- Myocardial infarction (2300 cases)
- Diabetes (7000 cases)
- Mortality (7800 deceased)

Biomarker

- Nested case-control design
- 1372 colorectal cases and 1372 matched controls
- The biomarker "Alkylresorcinols" analyzed using GC-MS

Whole grains and colorectal cancer

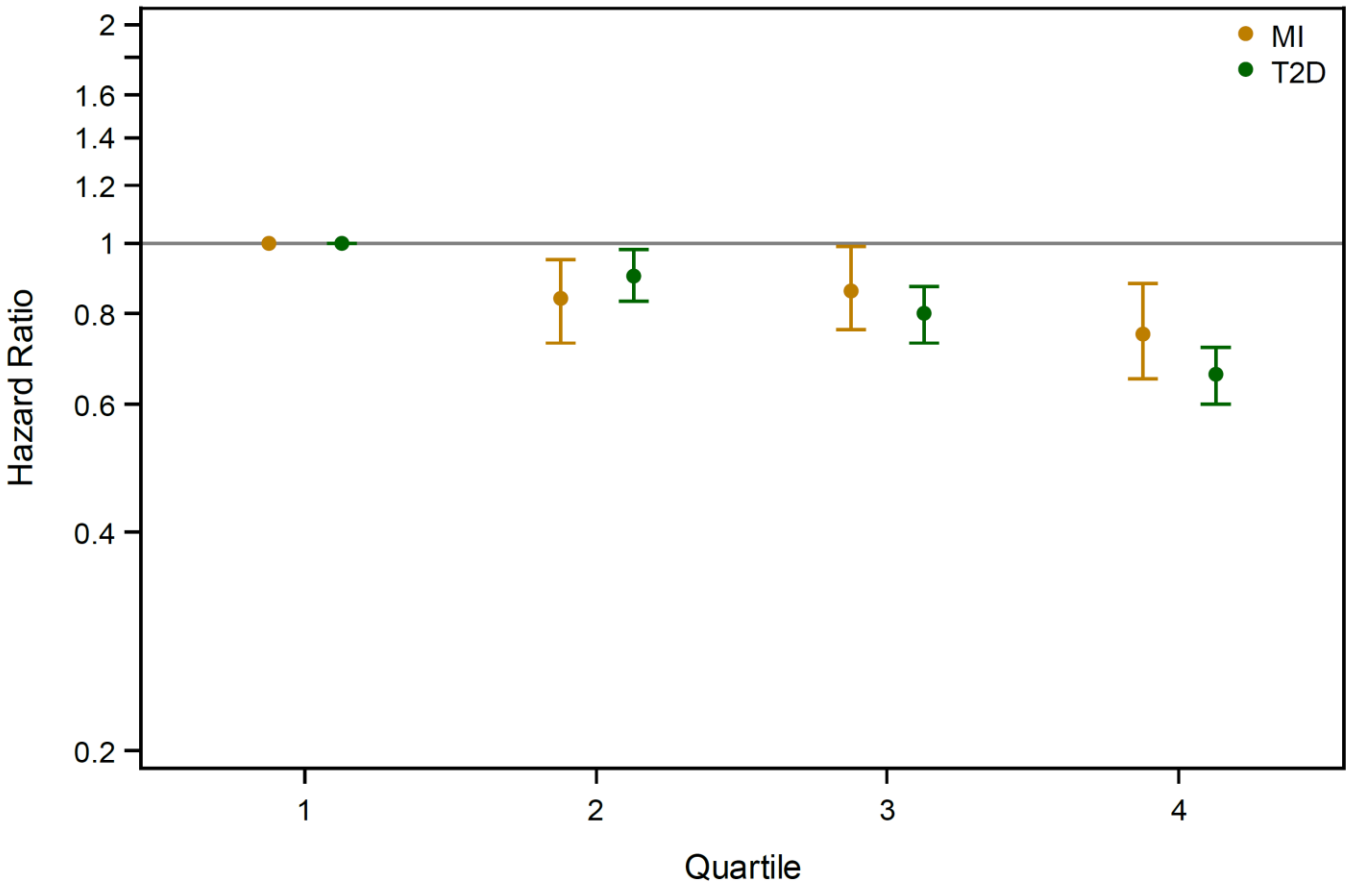
Figure 1: Dose-response meta-analysis of wholegrains intake and colorectal cancer per 90 grams per day



World Cancer Research Fund/American Institute for Cancer Research, Continuous Update Project Report: Diet, Nutrition, Physical Activity and Colorectal cancer, 2017.

Whole grains

and risk of type 2 diabetes (men)

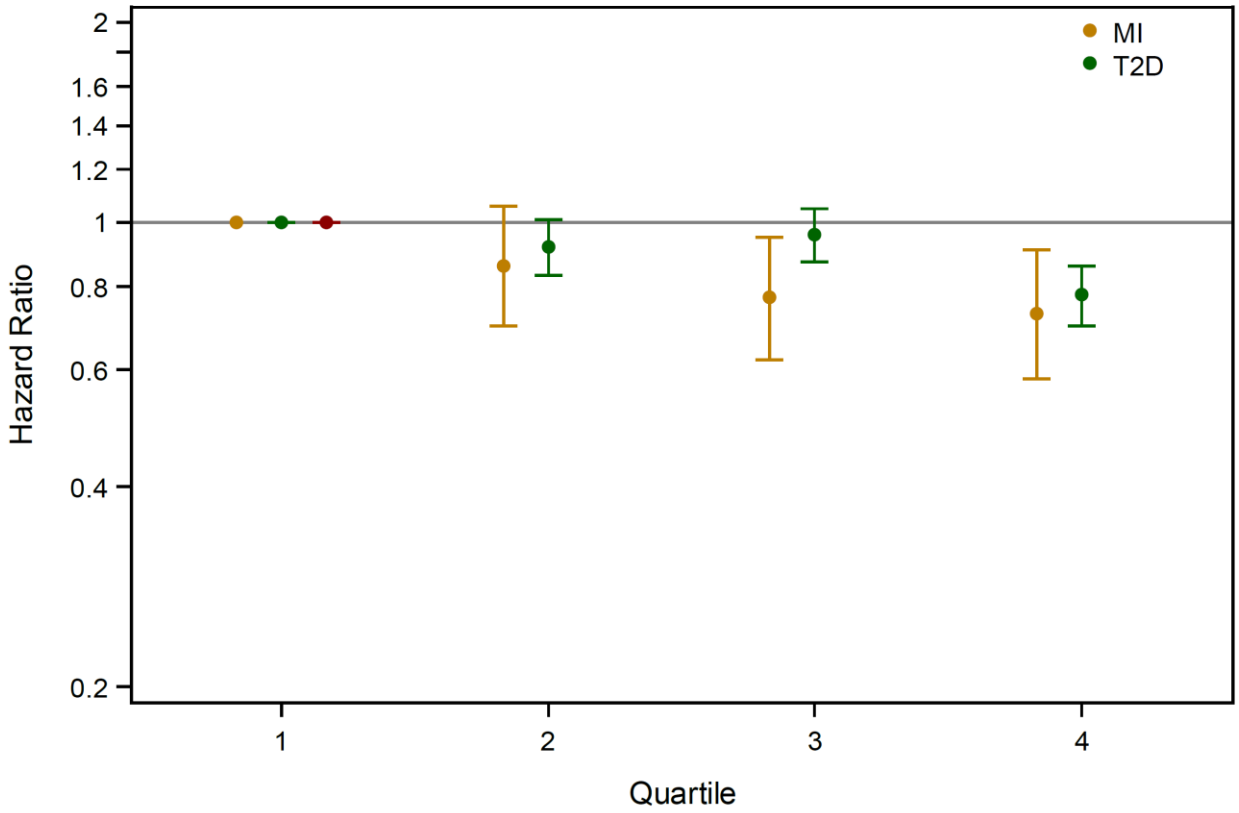


Kyro et al. (2017), submitted (confidential)

Helnæs, Kyro et al. (2016), Am J Clin Nutr 103(4): 999-1007.

Whole grains

and risk of type 2 diabetes (women)



Kyro et al. (2017), submitted (confidential)

Helnæs, Kyro et al. (2016), Am J Clin Nutr 103(4): 999-1007.

Whole grains and diabetes mortality

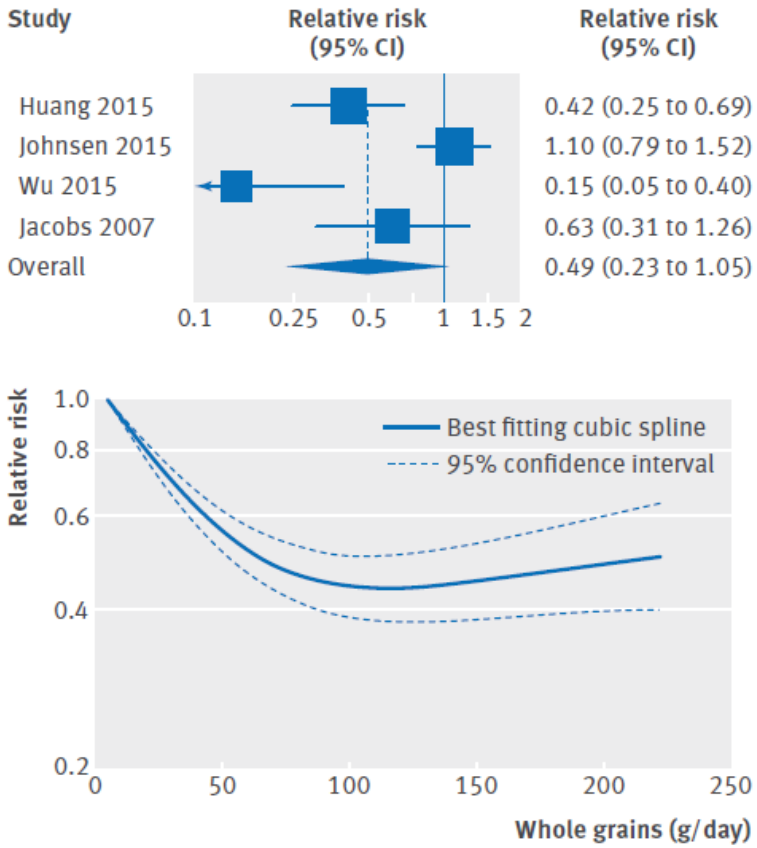


Fig 8 | Forest plot for consumption of whole grains (per 90 g/day) and risk of mortality from diabetes, with graph illustrating non-linear response

Aune et al. (2016), BMJ 353: i2716.

Acknowledgements

Danish Cancer Society Research Center

- Anja Olsen
- Anne Tjønneland
- Anne Kathrine Helnæs
- Vibeke Gunge
- Sandra Lacoppidan

Innovation Fund Denmark

RESEARCH, TECHNOLOGY & GROWTH

HELGA

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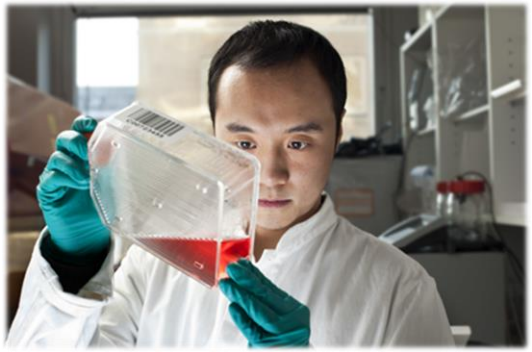
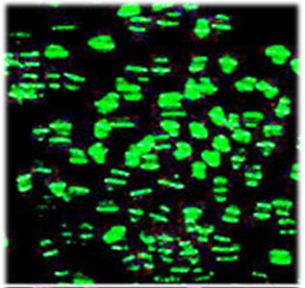
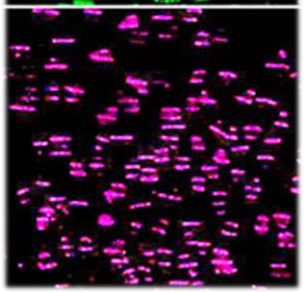
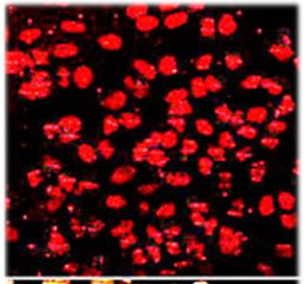
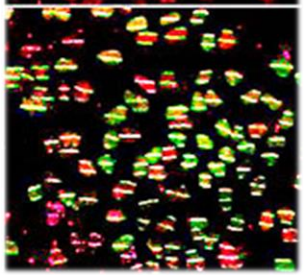
NordForsk



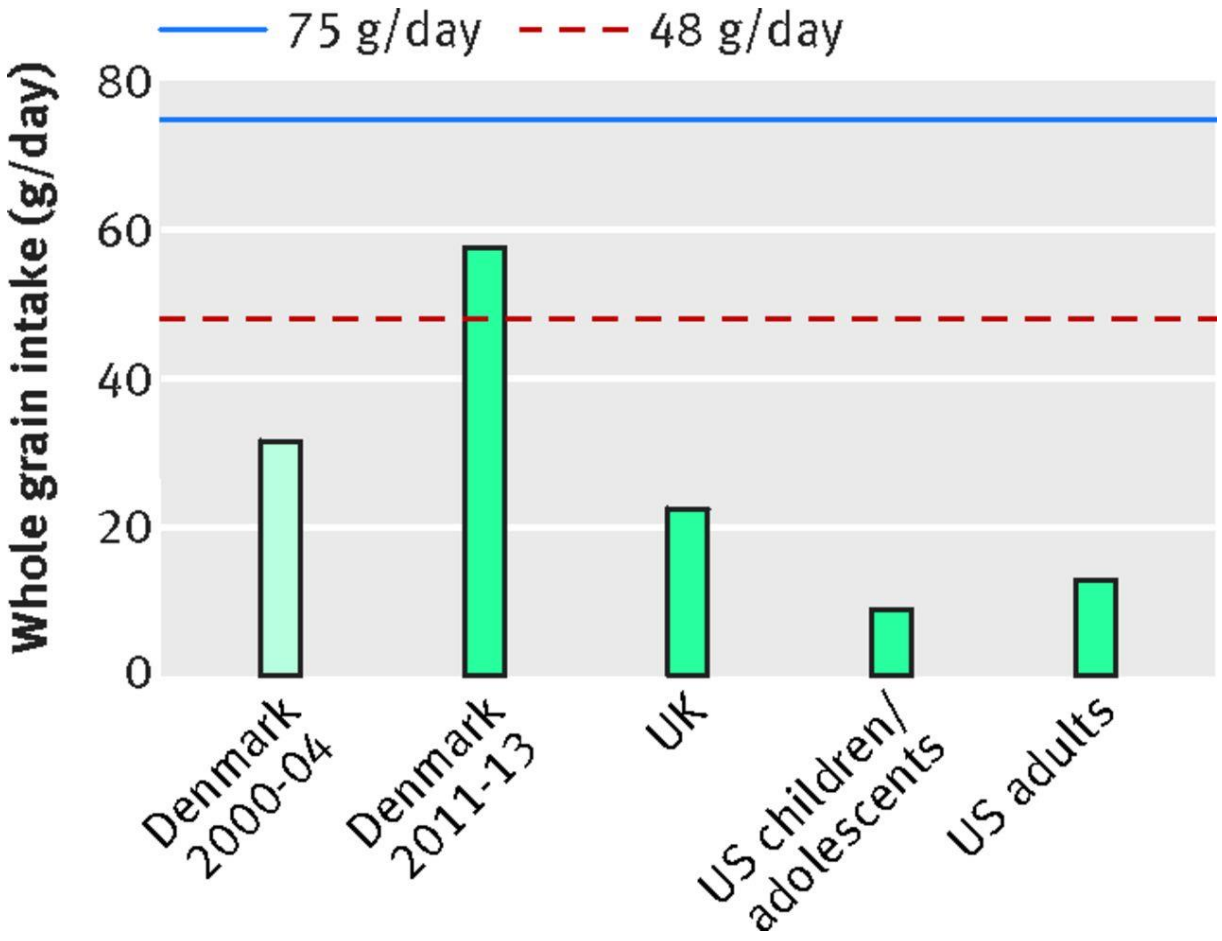








Whole-grain intake



Kyrø & Tjønneland BMJ (2016);353:bmj.i3046