

# Whole-grain and fibre intake and colorectal cancer

new results from the HELGA and EPIC cohorts



**Anja Olsen, Senior Researcher**

Danish Cancer Society Research Center

Copenhagen, Denmark

***HEALTHGRAIN Forum Symposium***

*ICN2013, Granada*

*September 18, 2013*

# Colorectal cancer

- Third most common cancer in the world (1.2 million cases in 2008)
- 10-fold higher in developed countries compared to developing countries

## **Risk factors:**

- Western lifestyle ( $\approx 40\%$ )
- Hormonal factors
- Familial adenomatous polyposis (FAP)
- Hereditary nonpolyposis colorectal cancer (HNPCC/Lynch syndrome)
- ...?



# WCRF/AICR Continuous Update Project, 2011

<b>FOOD, NUTRITION, PHYSICAL ACTIVITY AND CANCERS OF THE COLON AND THE RECTUM 2011</b>		
	<b>DECREASES RISK</b>	<b>INCREASES RISK</b>
<b>Convincing</b>	Physical activity <sup>1,2</sup> Foods containing dietary fibre <sup>3</sup>	Red meat <sup>4,5</sup> Processed meat <sup>4,6</sup> Alcoholic drinks (men) <sup>7</sup> Body fatness Abdominal fatness Adult attained height <sup>8</sup>
<b>Probable</b>	Garlic Milk <sup>9</sup> Calcium <sup>10</sup>	Alcoholic drinks (women) <sup>7</sup>

**Change from "probable" to "convincing"**



# Recent meta-analysis

BMJ

BMJ 2011;343:d6617 doi: 10.1136/bmj.d6617 (Published 10 November 2011)

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RESEARCH

## Dietary fibre, whole grains, and risk of colorectal cancer: systematic review and dose-response meta-analysis of prospective studies

 OPEN ACCESS

Dagfinn Aune *research associate*<sup>1</sup>, Doris S M Chan *research associate*<sup>1</sup>, Rosa Lau *research associate*<sup>1</sup>, Rui Vieira *data manager*<sup>1</sup>, Darren C Greenwood *senior lecturer in biostatistics*<sup>2</sup>, Ellen Kampman *professor of diet and cancer*<sup>3</sup>, Teresa Norat *principal investigator*<sup>1</sup>

<sup>1</sup>Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, St Mary's Campus, London W2 1PG, UK;

<sup>2</sup>Biostatistics Unit, Centre for Epidemiology and Biostatistics, University of Leeds, Leeds, UK; <sup>3</sup>Division of Human Nutrition, Wageningen University and Research Centre, Wageningen, Netherlands



# Compounds in whole grains

## Bran:

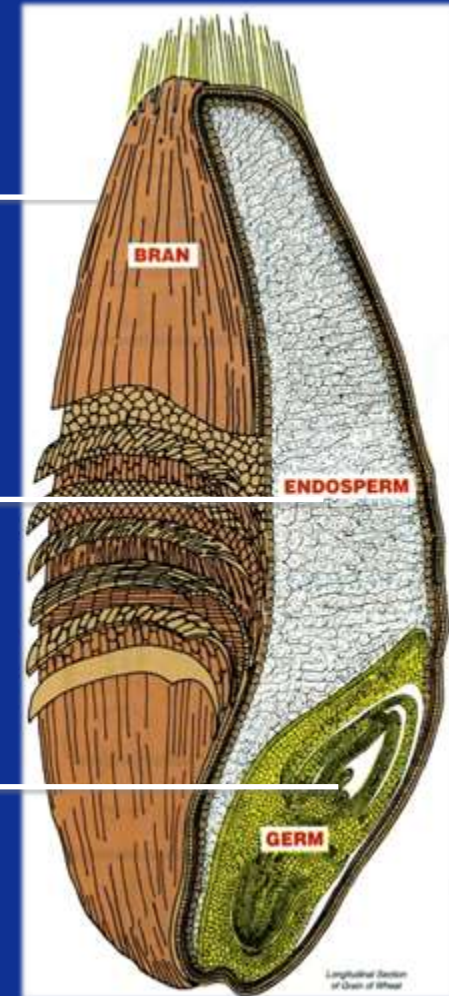
- B vitamins
- Phytochemicals
- Protein
- Dietary fiber

## Endosperm:

- Protein
- Carbohydrates

## Germ:

- B vitamins
- Polyunsaturated FA
- Phytochemicals
- Vitamin E
- Minerals



# Colorectal cancer

## Studies on fibre and whole grains



IJC  
International Journal of Cancer

### Intake of dietary fiber, especially from cereal foods, is associated with lower incidence of colon cancer in the HELGA cohort

Louise Hansen<sup>1</sup>, Guri Skeie<sup>2</sup>, Rikard Landberg<sup>3</sup>, Eiliv Lund<sup>2</sup>, Richard Palmqvist<sup>4</sup>, Ingegerd Johansson<sup>5</sup>, Lars O. Dragsted<sup>6</sup>, Rikke Egeberg<sup>1</sup>, Nina F. Johnsen<sup>1</sup>, Jane Christensen<sup>1</sup>, Kim Overvad<sup>7,8</sup>, Anne Tjønneland<sup>1</sup> and Anja Olsen<sup>1</sup>

Cancer Causes Control (2013) 24:1363–1374  
DOI 10.1007/s10552-013-0215-z

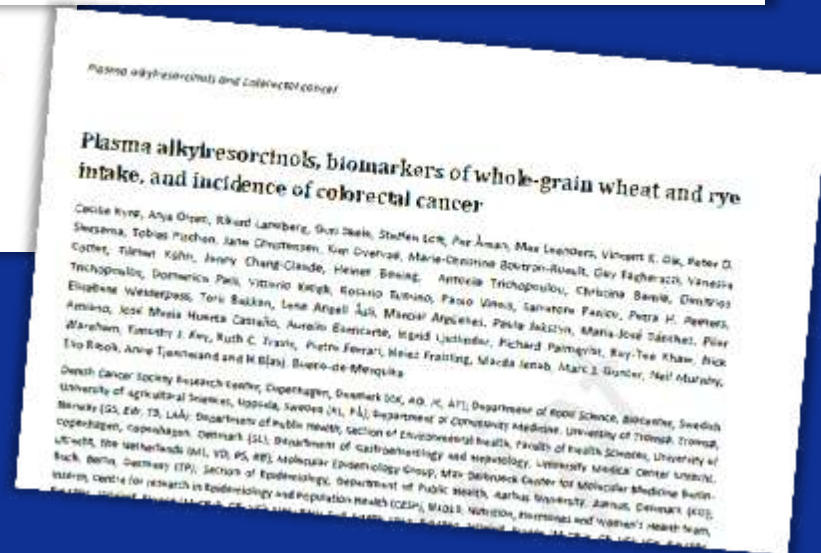
ORIGINAL PAPER

### Intake of whole grains from different cereal and food sources and incidence of colorectal cancer in the Scandinavian HELGA cohort

Cecilie Kyrø · Guri Skeie · Steffen Loft · Rikard Landberg · Jane Christensen · Eiliv Lund · Lena M. Nilsson · Richard Palmqvist · Anne Tjønneland · Anja Olsen



EPIC Project





# The EPIC and HELGA cohorts

## The HELGA cohort (*n* 120 000):

- The Norwegian Women and Cancer Study (*n* 37 000)
- The Northern Sweden Health and Disease Study (*n* 26 000)
- The Danish Diet, Cancer and Health Cohort Study (*n* 57 000)

## European Prospective Investigation into Cancer and Nutrition (EPIC) cohort (*n* 500 000)

- 23 centres in 10 European countries



# HELGA: Exposure and outcome

## Outcome:

- ~ 1200 colorectal cancer cases
- ~ 12 y follow-up

## Exposures:

- Calculated intake of dietary fiber
- Sources of fiber
- Whole-grain products





# Fibre intake in the HELGA cohort

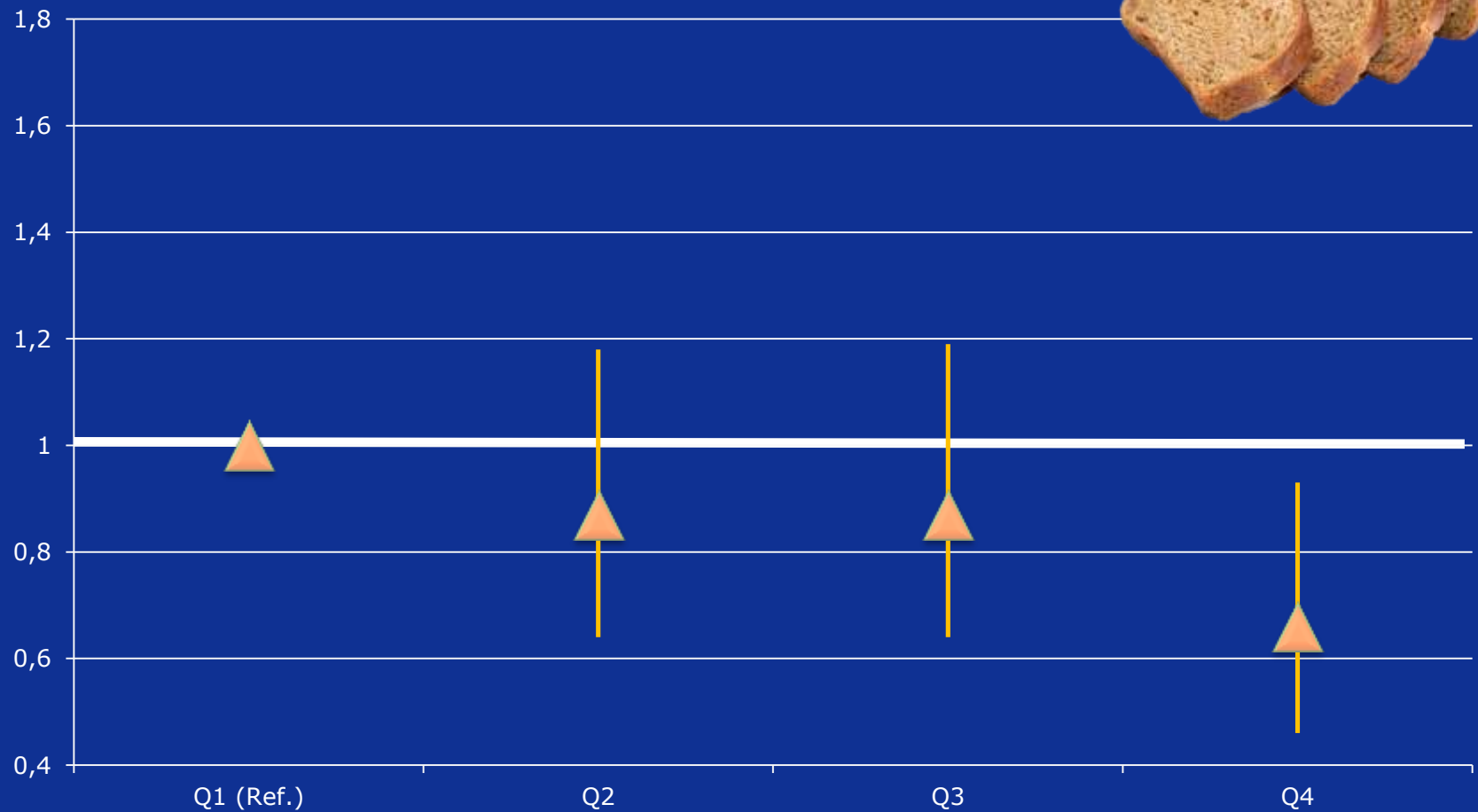
<b>Intake (g/day)</b>	<b>Men Median (5–95)</b>	<b>Women Median (5–95)</b>
Vegetable fibre	3 (0–8)	3 (1–8)
Fruit fibre	2 (0–8)	3 (0–9)
Potato fibre	3 (1–6)	2 (0–4)
Cereal fibre	13 (5–25)	11 (5–20)
<b>Total fiber</b>	<b>22 (10–38)</b>	<b>20 (10–34)</b>

# Total dietary fibre and colorectal cancer



# Fibre from different sources and colorectal cancer

## Cereal fibre (men)



# Conclusion

- Dietary fibre was found associated to colon cancer incidence in the HELGA cohort
- The association was only statistical significant for cereal fibre
- The association was strongest and most consistent among men
- A tendency towards strongest effect for distal colon cancer



# Cancer Causes & Control

An International Journal of Studies of Cancer in Human Populations

Official Journal of the Harvard Center for Cancer Prevention

## Intake of whole grains from different cereal and food sources and incidence of colorectal cancer in the Scandinavian HELGA cohort

Cedric Kyre · Guri Skeie · Steffen Loft · Eikhard Lundberg · Jone Christensen · Elin Lund · Lena M. Nilsson · Richard Palmqvist · Anne Tjønneland · Anja Olsen

Received: 1 February 2013 / Accepted: 14 April 2013 / Published online: 20 April 2013  
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### Abstract

**Purpose** A high intake of whole grains has been associated with a lower incidence of colorectal cancer, but few studies are available on the association with whole grain from different cereals, for example, wheat, rye and oats, and none has addressed these separately. The objective of this study was to investigate the association between whole-grain intake and colorectal cancer.

**Method** We used data from the large population-based Scandinavian cohort HELGA, consisting of 108,000

Danish, Swedish, and Norwegian persons, of whom 1,127 developed colorectal cancer during a median of 11 years of follow-up. Detailed information on daily intake of whole-grain products, including whole-grain bread, crispbread, and breakfast cereals, was available, and intake of total whole grains and specific whole-grain species (wheat, rye, and oats) were estimated. Associations between these whole-grain variables and the incidence of colorectal cancer were investigated using Cox proportional hazards models. Intake of whole-grain products was associated with a lower incidence of colorectal cancer per 20-g increment (incidence rate ratio (IRR), 0.94; 95 % confidence interval (CI), 0.89, 0.99); and the same tendency was found for total whole-grain intake (IRR per 25-g increment: 0.94; 95 % CI, 0.88, 1.01). Intake of whole-grain wheat was associated with a lower incidence of colorectal cancer (IRR for highest versus lowest quartile of intake, 0.86; 95 % CI, 0.71, 0.85), but no statistical significant linear trend was observed (p for trend = 0.19). No significant association was found for whole-grain rye or oats.

**Conclusion** Whole-grain intake was associated with a lower incidence of colorectal cancer.

**Keywords** Whole grains · Colorectal cancer · Wheat · Rye · Oats

### Introduction

Colorectal cancer is the third commonest cancer worldwide; in 2008, it was diagnosed in 1.2 million people [1]. Whole grains are rich in fiber, phytochemicals, B vitamins, and other active substances with possible health effects [2]. In contrast, refined cereals retain almost only the starchy endosperm when the germ and bran have been removed. It

Electronic supplementary material The online version of this article (doi:10.1007/s00535-013-0713-z) contains supplementary material, which is available to authorized users.

C. Kyre (✉) · J. Christensen · A. Tjønneland · A. Olsen  
Danish Cancer Society Research Center, Artillerivej 69,  
2300 Copenhagen S, Denmark  
e-mail: cedric.kyre@statens-serum.dk

G. Skeie · E. Lund  
Department of Community Medicine, University of Tromsø,  
Tromsø, Norway

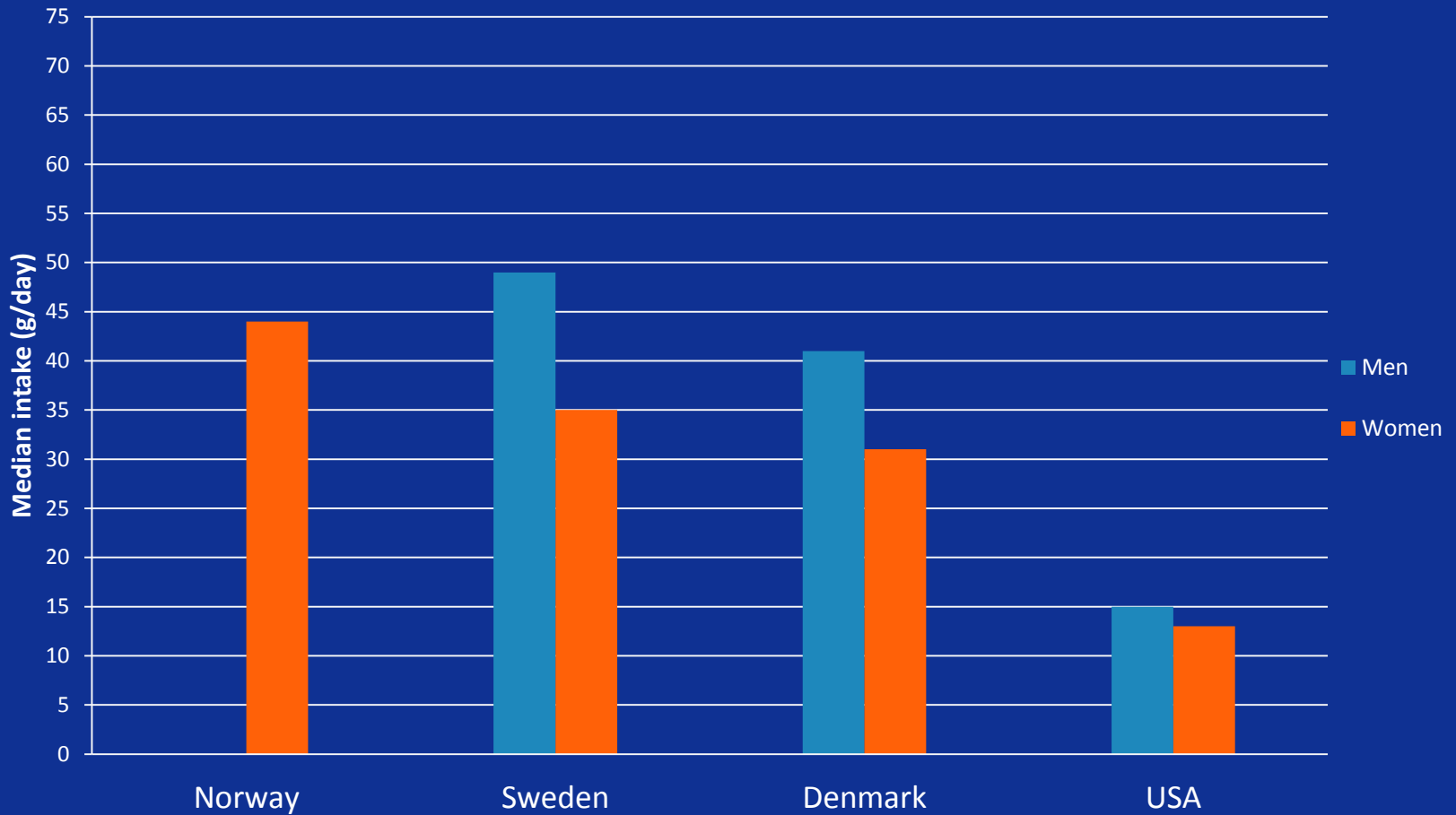
S. Loft  
Department of Public Health, Section of Environmental Health,  
Faculty of Health Sciences, University of Copenhagen,  
Copenhagen, Denmark

E. Lundberg  
Department of Food Science, BioCenter, Swedish University of  
Agricultural Sciences, Uppsala, Sweden

L. M. Nilsson  
Department of Public Health and Clinical Medicine, National  
Research, Umeå University, Umeå, Sweden

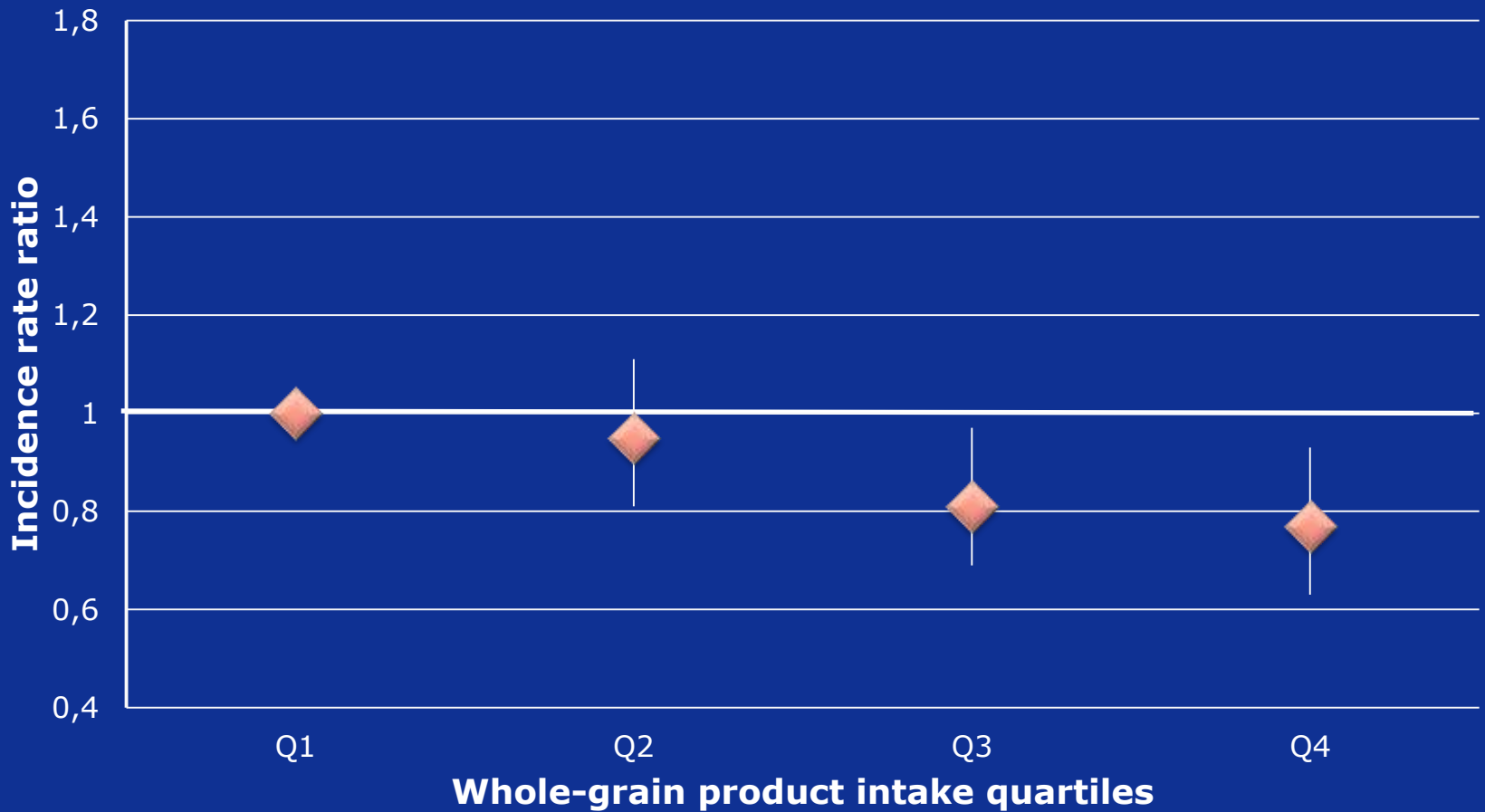
R. Palmqvist  
Department of Medical Biometrics, Palladium, Umeå  
University, Umeå, Sweden

# Calculated whole-grain intake





# Whole-grain product intake (g product/day) and incidence of colorectal cancer



# Conclusion

- **Intake of whole grains associated with lower incidence of colorectal cancer**
- The association was only significant for *whole-grain products* and not for total *whole-grain intake (g/day)*
- Wheat was the only cereal type that alone was associated with colorectal cancer incidence
- No apparent difference depending on colorectal cancer sub-site



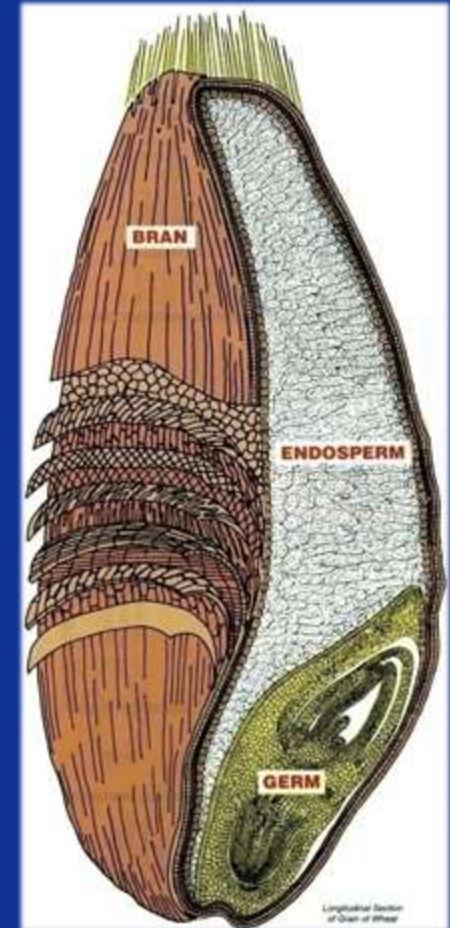
# Exposure measurement – Whole grains

- Most cohort studies have no or low quality information on whole grain intake
- Especially difficult, because it is difficult to know how much whole grain the products contain



# Alkylresorcinols - biomarkers

- Alkylresorcinols are only present in bran and whole grains
- Not destroyed during food processing
- Well absorbed in humans
  - After absorption, transported in lipoprotein fractions and in erythrocyte membranes and may be distributed and stored in some tissue, especially adipose tissue
- Validated (measured in plasma) both in intervention and cohort studies
  - Intra-class correlation coefficient =0.88–0.90
  - Dietary assessment vs. plasma alkylresorcinol:  $r=0.25-0.57$



# Alkylresorcinols and colorectal cancer

- Plasma levels of alkylresorcinols and risk of colorectal cancer
- Nested case-control design
- 1550 colorectal cancer cases and 1550 controls from 10 European countries (total cohort, n=500 000)



# Alkylresorcinols and colorectal cancer - methods

- **Matching**

Colorectal cancer cases were matched to controls (1:1) by:

Age, gender, study center, time of blood collection, fasting status, menopausal status, use of HRT/oral contraceptives



- **Laboratory analysis**

- Alkylresorcinols, 5 different homologues (C17:0, C19:0, C21:0, C23:0, C25:0)
- Measured in plasma samples using GC-MS



- **Statistical analysis**

Conditional Logistic Regression



# Take home message

- Increasing evidence that dietary fibre is associated with decreased risk of colon cancer
- This association may – to a high degree – be linked to WG as a fibre source and maybe other constituents of WG
- No clear difference in association by whole-grain source
- Maybe some differences by colon sub-site (left side)?
- Should WG be classified as protective?



# Acknowledgements:

