Plant foods and cancer risk: findings from EPIC
EPIC: 500,000 men and women in 10 countries

- Tromsø
- Umeå
- Malmö
- Aarhus
- Copenhagen
- Oxford
- Cambridge
- Potsdam
- Heidelberg
- Utrecht
- Bilthoven
- Paris (nationwide)
- Turin
- Milan
- Florence
- Naples
- Ragusa
- Oviedo
- San Sebastian
- Pamplona
- Murcia
- Granada
- Athens (nationwide)
QUESTIONNAIRES
BLOOD COLLECTION

TIME

1993...........1998

1993..............1999.........................2010....

FOLLOW-UP:
cancer diagnosis
mortality
changes in life style....
EPIC study – February 2013 update

- Half a million men and women recruited 1993-1999
- 60,000 have developed cancer since recruitment
- Main results now being published
EPIC launch: cover feature in “New Scientist” magazine November 1991

“…expects…to reinforce the advice that fruit and vegetables offer protection against cancers of the lung, stomach, large bowel and oesophagus”
Plant foods considered

- Fruit and vegetables
- Dietary fibre
- Nuts and seeds
Fruit intake in women in selected EPIC centres

Norway, north
Norway, south
Sweden, north
Sweden, south
Denmark
UK, health-conscious
UK, general
Netherlands
Germany
France, north-east
France, south
Italy, Varese
Italy, Ragusa
Spain, San Sebastain
Spain, Murcia
Greece

Agudo et al, PHNutr 2002
Vegetable intake in women in selected EPIC centres

Agudo et al, PHNutr 2002
### Categories of intake, g/day

<table>
<thead>
<tr>
<th></th>
<th>Lowest</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>&lt;90</td>
<td>90-154</td>
<td>155-239</td>
<td>240-354</td>
<td>355+</td>
</tr>
<tr>
<td>Vegetables</td>
<td>&lt;100</td>
<td>100-149</td>
<td>150-209</td>
<td>210-304</td>
<td>305+</td>
</tr>
<tr>
<td>Fibre</td>
<td>&lt;16.4</td>
<td>16.4-20.0</td>
<td>20.1-23.5</td>
<td>23.6-28.4</td>
<td>28.5+</td>
</tr>
</tbody>
</table>
Cancers of the mouth, pharynx, larynx and oesophagus

352 cases: Boeing et al, Cancer Causes Control 2006
Stomach cancer

RR (95% CI)

Fruit
Vegetables
Fibre

P trend=0.05
P trend=0.18
P trend=0.82

Quantile of intake

Fruit and vegetables, 683 cases: Gonzalez et al 2012
Fibre, 312 cases: Mendez et al 2007
Stomach cancer: fruit and vegetables, by smoking

RR (95% CI)

Never smokers

Current smokers

Fruit and vegetables, 683 cases: Gonzalez et al 2012
Fruit and vegetables, 2819 cases: van Duijnhoven et al, Am J Clin Nutr 2009
Fibre, 4517 cases: Murphy et al PLoS ONE 2012
Colorectal cancer: cereal and fruit and vegetable fibre

RR (95% CI)

Cereal fibre

Fruit and vegetable fibre

P trend=0.004

P trend=0.19

Quintile of intake

Fruit and vegetables, 2819 cases: van Duijnhoven et al, Am J Clin Nutr 2009
Fibre, 4517 cases: Murphy et al PLoS ONE 2012
Colorectal cancer: nuts and seeds

RR (95% CI)

0 g/d, ≤0.8 g/d, >0.8-2.3 g/d, >2.3-6.2 g/d, >6.2 g/d

P trend = 0.23

1329 cases: Jenab et al, CEBP 2004
Liver & Biliary tract cancer

Liver & fibre

Biliary tract & fibre

RR (95% CI)

P trend=0.01

P trend=0.37

Liver, 191 cases, biliary tract, 236 cases: Fedirko et al, Ann Oncology 2013
Pancreatic cancer

555 cases: Vrieling et al, Int J Cancer 2009
Lung cancer

RR (95% CI)

Quantile of intake

Fruit

P trend = 0.01

Vegetables

P trend = 0.58

1830 cases: Buchner et al, Cancer Causes Control 2010
Lung cancer and fruit, subdivided by smoking

RR (95% CI)

P trend = 0.04
P trend = 0.63

1830 cases: Buchner et al, Cancer Causes Control 2010
Breast cancer

Fruit and vegetables, 3659 cases, van Gils et al JAMA 2005
Fibre, 11576 cases, Ferrari et al Am J Clin Nutr 2013
Breast cancer and fibre: subgroup analyses

Fibre from vegetables, overall

RR (95% CI)

1.4

1.2

1.0

0.8

0.6

0.4

0.2

0

Fibre from vegetables, overall

P trend < 0.01

P trend = 0.01

Quintile of intake

Q1 Q2 Q3 Q4 Q5 Q1 Q2 Q3 Q4 Q5

11576 cases, Ferrari et al Am J Clin Nutr 2013
Cervical cancer

RR (95% CI)

P trend=0.19  P trend=0.39

Quantile of intake

253 cases: Gonzalez et al, Int J Cancer 2011
Endometrial cancer

RR (95% CI)

Dietary fibre

P trend=0.41

710 cases: Cust et al, Am J Epidemiol 2007
Prostate cancer

Fruit and vegetables, 1104 cases: Key et al, Int J Cancer 2004
Fibre, 2747 cases: Suzuki et al 2009
Kidney cancer

RR (95% CI)

507 cases: Allen et al, Int J Cancer 2009
Bladder cancer

Fruit and vegetables, 1015 cases: Buchner et al, Int J Cancer 2009
Fibre, 1416 cases: Allen et al, Int J Cancer 2013
Lymphoma

RR (95% CI)

- Fruit
  - P trend = 0.63

- Vegetables
  - P trend = 0.72

849 cases: Rohrmann et al, Cancer Causes Control 2007
## Fruit and vegetables and total cancer risk: results from EPIC

<table>
<thead>
<tr>
<th>Types of cancer</th>
<th>Number of cancers</th>
<th>HR for 200 g/d increment in fruit and vegetable consumption</th>
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</thead>
<tbody>
<tr>
<td>Caused by tobacco</td>
<td>5,034</td>
<td>0.92 (0.90-0.95)</td>
</tr>
<tr>
<td>Not caused by tobacco</td>
<td>25,570</td>
<td>0.98 (0.97-1.00)</td>
</tr>
</tbody>
</table>

Boffetta et al JNCI 2010
Comments

• Little evidence for “broad anti-cancer effect”
• Relatively affluent population
  – Wide range of intakes
  – But few with very low intakes
• How strong are the hypotheses?
  – Fibre and colorectal cancer - strong
  – Micronutrients – unlikely that more is better than enough?
  – Anti-oxidants – still not clear what role is
Conclusions – inverse associations observed

- Upper gastro-intestinal tract
  - Fruit – but small numbers, possible residual confounding
- Colorectal
  - Fruit and vegetables
  - Fibre (cereal)
- Liver
  - Fibre – but small numbers
- Lung
  - Fruit – but only in smokers, probable residual confounding
- Breast
  - Fibre – but borderline
- Stomach, biliary tract, pancreas, cervix, endometrium, prostate, kidney, bladder, lymphoma
  - None