Citation:

Halkjaer J, Tjønneland A, Overvad K, Sørensen TI. Dietary predictors of 5-year changes in waist circumference. J Am Diet Assoc. 2009 Aug;109(8):1356-66.

PubMed ID: 19631041

Study Design:

Prospective cohort study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

This study investigated the association between intake from 21 food and beverage groups and the subsequent 5-year difference in waist circumference in middle-aged men and women.

Inclusion Criteria:

The data are from the Danish Diet, Cancer and Health Study (December 1993-May 1997):

- all men and women aged 50-64 years
- born in Denmark
- living in the greater Copenhagen or Aarhus area
- no previous cancer diagnosis registered in the Danish Cancer Registry

Exclusion Criteria:

Recorded cancer diagnosis in the Danish Cancer Registry

Description of Study Protocol:

Recruitment

From December 1993 to May 1997, all men and women aged 50-64 years, born in Denmark. living in the greater Copenhagen or Aarhus areas, and with no previous cancer diagnosis, were invited to participate in the study. Participants were identified from the computerized records of the Civil Registration System in Denmark. Follow-up invitations sent approximately 5 years later

Design: Trend study

Data was collected at baseline and follow-up: waist circumference, baseline diet (192 items food-frequency questionnaire), body mass index, selected potential confounders (eg smoking

status, sport activities, and intake of alcoholic beverages).

Statistical Analysis

The associations between dietary components and waist changes were investigated by multiple linear regression analyses. The analyses were run and presented separately for the two sexes. Analysis strategies included: A) Basic model; B) Test for heterogeneity; C) Test for deviations from linearity; D) Best fit model; E) Test for sex differences

Data Collection Summary:

Timing of Measurements

- baseline: December 1993 - May, 1997
- follow-up: September 1999 - October, 2002

Dependent Variables

- Change in waist circumference at 5 years= [follow-up waist circumference - baseline waist circumference) / follow-up time] x 5
    - Waist circumference (cm) - subjects themselves measured the follow-up data of waist circumference

Independent Variables

- Dietary intake: measured using a 192-item, semi-quantitative, food frequency questionnaire; items collapsed into 21 categories

Covariates

- Lifestyle variables: data gathered from questionnaire (sports activities, smoking habits and intake of acloholic beverages)

Description of Actual Data Sample:

Initial N:

- N = 160,725 invited to participate;
- N = 54,379 participants eligible for the follow-up survey

Attrition (final N):

- N = 44,897 were included in the follow-up study sample
- N = 42,696 for analysis after exclusion for missing and implausible data

Age:aged 50-64 years

Ethnicity:Danish

Other relevant baseline measurements

	Women (n=22,570)	Men (n=20,126)
Observed waist cicumference (cm)	80.0 (67.0-102.5)	95.0 (81.0-113.0)
Observed weight (kg)	67.0 (52.8-90.7)	81.7 (65.4-104.5)
Height (m)	1.64 (1.55-1.74)	1.77 (1.67-1.88)
Observed body mass index	24.7 (20.0-33.4)	26.2 (21.5-32.6)
Sports acitivies at least 30 min/wk (%)	61.4	51.1
Current smoker (%)	29.3	36.4

Location:greater Copenhagen or Aarhus areas of Denmark

Summary of Results:

Key Findings

- For women, 5-year difference in waist circumference was inversely related to intake from red meat, vegetables, fruit, butter and high-fat dairy products.
- For women, 5-year difference in waist circumference was positively associated with intake from potatoes, processed meat, poulty, and snack foods.
- For men, 5-year difference in waist circumference were inversely related to intake from red meat and fruit intake.
- For men, 5-year difference in waist circumference was postively associated with intake of snack foods.
- Sex differences occured for vegetables, high-fat dairy products and processed meat.

Associations (regression coefficients and 95% CI) between intake of different food and beverage groups (per 60 kcal/d or 500g/d for coffee and tea) and 5-year differences in waist circumference (WC) (cm) for Danish mean and women

Food or beverage group	Women (n= 22,570) 5-year difference in WC (cm) 95% CI	*P* value	Men (n=20,126) 5-year difference in WC (cm) 95% CI	*P* value	$P_{interaction}$
per 60 kcal/d					
Vegetables	-0.36 (-0.51 to -0.21)	<0.0001	0.04 (-0.10 to 0.17)	0.07	0.0002
Fruit	-0.07 (-0.13 to -0.004)	<0.0001	-0.10 (-0.15 to -0.04)	0.07	0.54
Juices	-0.15 (-0.38 to 0.09)	<0.0001	0.11 (-0.09 to 0.31)	0.07	0.09
Potatoes	0.10 (0.006 to 0.19)	<0.0001	-0.01 (-0.07 to 0.05)	0.07	0.05
Refined grain cereals	0.07 (-0.01 to 0.14)	0.36	0.03 (-0.02 to 0.08)	0.48	0.46
Whole-grain cereals	0.03 (-0.01 to 0.07)	0.36	0.01 (0.01 to 0.04)	0.48	0.58
Red meat	-0.13 (-0.24 to -0.03)	0.008	-0.06 (-0.11 to -0.003)	0.26	0.19
Processed meat	0.20 (0.04 to 0.36)	0.008	0.01 (-0.06 ot 0.08)	0.26	0.04
Poultry	0.19	0.008	0.05 (-0.08 to 0.17)	0.26	0.19
Fish	-0.004 (-0.16 to 0.15)	0.008	-0.04 (-0.14 to 0.06)	0.26	0.70

Eggs	0.10 (-0.08 tp 0.28)	0.008	0.08 (-0.05 to 0.20)	0.26	0.83
Low-fat dairy products	-0.04 (-0.08 to 0.01)	0.19	-0.001 (-0.04 to 0.03)	0.74	0.25
High-fat dairy products	-0.09 (-0.15 to -0.03)	0.19	-0.01 (-0.05 to 0.03)	0.74	0.04
Butter	-0.12 (-0.20 to -0.04)	0.29	-0.03 (-0.08 to 0.03)	0.12	0.06
Vegetable oil	-0.03 (-0.15 to 0.09)	0.29	0.03 (0.04 to 0.11)	0.12	0.41
Margarine	-0.04 (-0.14 to 0.07)	0.29	-0.05 (-0.12 to 0.006)	0.12	0.79
Jams, syrups, sugar	0.05 (-0.03 to 0.13)	0.95	-0.0004 (-0.06 to 0.06)	0.02	0.29
Soft drinks	0.01 (-0.24 to 0.27)	0.95	-0.02 (-0.12 to 0.08)	0.02	0.80
Snack Foods	0.06 (0.003 to 0.11)	0.95	0.09 (0.05 to 0.13)	0.02	0.35
Per 500 g/d					
Coffee	0.12 (-0.01 to 0.24)	0.74	0.06 (-0.03 to 0.16)	0.50	0.51
Tea	0.09 (-0.04 to 0.22)	0.74	0.11 (-0.01 to 0.22)	0.50	0.87

Author Conclusion:

The results suggest that a diet low in fruits and red meat and high in snack foods was associated with larger waist circumference gains in both sexes. Furthermore, in women a diet low in vegetables, butter, and high-fat dairy products, and high in poultry, potatoes, and processed meat

were likely determinants of subsequent gain at the waist.

Reviewer Comments:

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A

3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes

6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	N/A
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A

	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	Yes
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes