

Citation:

Wagemakers JJMF, Prynne CJ, Stephen AM, Wadsworth MFJ. Consumption of red or processed meat does not predict risk factors for coronary heart disease; results from a cohort of British adults in 1989 and 1999. Eur J Clin Nutr 2009;63:303-311.

PubMed ID: [18000518](#)

Study Design:

Cohort

Class:

B - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the relationship between consumption of red and processed meat, after disaggregation of composite dishes, with risk factors for coronary heart disease (CHD) using data from the UK Medical Research Council National Survey of Health and Development (NSHD) 1946 Birth Cohort.

Meat consumption was assessed in 1989 and 1999 and related to risk factors assessed in 1999. Thus, an aim of the study was to investigate whether meat consumption could predict CHD 10 years later.

Inclusion Criteria:

Inclusion criteria included:

- Men and women who were members of the Medical Research Council NSHD
- Singleton, legitimate births in England, Scotland, and Wales during the first week of March, 1946

Exclusion Criteria:

Exclusion criteria included:

- Men and women who did not meet inclusion criteria
- No health or demographic exclusion criteria were presented

Description of Study Protocol:

Recruitment--Members of the Mical Research Council and 1946 Birth Cohort from England,

Scotland, and Wales

Design--Social-class-stratified random longitudinal survey; random sample of 5,362 births.

Blinding used (if applicable)--N/A

Intervention (if applicable)--Anthropometric, dietary, lifestyle, and health data collected at two time periods:1989 and 1999.

Anthropometric:

Height, weight, and waist circumference measured in 1989 and 1999 using standardized protocols.

Dietary:

Food intake data were self-recorded and recorded using 5-day diaries at two time periods: 1989 and 1999 (included in analysis if at least 3 days were recorded). Meat consumption was estimated by adding individual meat portions to the meat fractions of composite dishes (mixed dishes containing vegetables and/ or cereals). In 1999, alcohol consumption was calculated from the dietary records.in 1999

Lifestyle:

In 1989, information was collected on socio-economic status based on occupation and region of residence.

Health outcomes:

Systolic and diastolic blood pressured were measured twice in 1989 and 1999. In 1999 only, non-fasting blood samples were analysed for total serum cholesterol concentration, low-density lipoprotein, and high-density lipoprotein.

Smoking status was assessed in 1999.

Statistical Analysis--

Statistical analysis included:

- Descriptive data presented in means and standard deviation (s.d.) or median and interquartile range for continuous variables and as percentages for categorical variables for men and women separately.
- Variations in meat consumption between men and women, between years, between regions and occupational social classes were compared using one-way analysis of variance.
- Multiple linear regression analysis was used to investigate associations between meat consumption (in thirds of intake) in 1989 and 1999 and health outcomes in 1999.
- Regression analysis was carried out to determine associations with serum cholesterol, blood pressure, BMI and waist circumference after adjustment for potential confounders, total energy intake, alcohol consumption, smoking, region and socio-economic status.

$P < 0.05$ was considered statistically significant.

Data Collection Summary:

Timing of Measurements

Blood pressure and anthropometric measurements were collected in 1989 and 1999. Assessment of diet was carried out in 1989 and 1999. Information on socio-economic status and region of residence was collected in 1989. Other measures (serum total cholesterol, low-density lipoprotein, and high-density lipoprotein), alcohol consumption, and smoking status were measured in 1999.

Dependent Variables

- BMI and waist circumference measured twice using standardized protocols in 1989 and 1999
- Serum cholesterol, low-density lipoprotein, and high-density lipoprotein collected non-fasting in 1999
- Blood pressure measured twice using standardized protocols in 1999

Independent Variables

- Mean intake per day of processed or red meat consumption in 1989 and 1999 (by thirds--low, middle and high) for men and women subjects

Control Variables

- Total energy intake
- Alcohol intake (g/day)
- Smoking status (current, past, or never)
- Region of residence (England, Scotland, or Wales)
- Socio-economic status based on occupation (manual or non-manual)
- Potential confounders

Description of Actual Data Sample:

Initial N: Did not present but indicated that 51.5% assessed in 1989 provided blood samples in 1999 and thus were included in analysis

Attrition (final N): 1152 men and women (517 men, 635 women) completed the study in 1999

Age: 43 in 1989; 53 at 1999

Ethnicity: Did not provide information

Other relevant demographics: Native born; indicated that subjects were representative of the native-born population of similar age

Anthropometrics

BMI In 1989 (by thirds of red and processed meat intake) (kg/m^2):

Men

Low: 26.0 ± 3.4

Middle: 26.5 ± 3.5

High: 27.0 ± 3.6

Women

Low: 26.1 ± 4.5

Middle: 26.5 ± 4.5

High: 26.7 ± 5.0

BMI in 1999 (by thirds of red and processed meat intake) (kg/m^2)

Men

Low: 25.9 ± 3.1

Middle: 26.9 ± 3.9

High: 26.8 ± 3.5

Women

Low: 25.8 ± 4.6

Middle: 26.0 ± 4.4

High: 27.5 ± 4.9

Location: Birth cohort in England, Scotland, and Wales

Summary of Results:

Key findings:

- Men consumed significantly more red and processed meat than women in 1989 and 1999 ($P < 0.001$)
- In both men and women, red and processed meat intake was significantly lower in 1989 compared with 1999 ($P < 0.001$).
- Although red meat intake did not differ between social classes in 1989 and 1999, intake of processed meat was significantly higher in manual than non-manual social class in 1999 only in men ($P = 0.003$) and women ($P = 0.02$).
- Body weight increased by more than 5 kg for both men and women between 1989 and 1999.
- There was no significant association between red or processed meat consumption in 1989 and 1999 and serum cholesterol concentrations and blood pressure measured in 1999.
- Red and processed meat intake in 1999 (by thirds) had a significant positive association with blood pressure in men only ($P < 0.01$).
- Red and processed meat intake was significantly associated with higher BMI in women only in 1999 ($P = 0.002$)
- Red and processed meat intakes, separately and combined, had a significant positive association with waist circumference in 1999; a 10 g increase in red meat consumption accounted for a 0.3 cm increase in waist circumference ($P = 0.04$ for men and 0.05 for women).

Author Conclusion:

Results suggest that consumption of red or processed meat measured 10 years earlier do not predict an increased risk of CHD as indicated by cholesterol concentration or blood pressure. However, there were significant positive associations between red or processed meat consumption increased waist circumference which also been identified as a risk factor.

Weaknesses included:

- Subjects were 53 years old in 1999, an age when health and mortality becomes more immediately pertinent so findings may not be extrapolated to the general population of the UK.
- Consumption of meat was self-reported; reporting bias may have affected estimates of the effect of red and processed meat on outcome variables.
- Of subjects who provided dietary data in 1989, not all provided physiological data in 1999 and were therefore not included in the study
- The majority of included subjects were of non-manual social class (managerial, professional occupations) who may have been more health aware than manual social class (skilled, non-skilled and agricultural occupations).
- Changes in cholesterol levels, blood pressure and weight could be due to aging or dietary factors changed with age.

Reviewer Comments:

Limitations of the study included:

- *Limited generalizability to other age and ethnic groups*
- *Not clear on number of subjects in 1989 and withdrawals between 1989 and 1999*
- *Did not assess physical activity or other dietary factors (other than meat consumption) that may have affected results*

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) | N/A |
| 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
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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?	No
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?	No
2.2.	Were criteria applied equally to all study groups?	???
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	???
3.	Were study groups comparable?	No
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	No
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	???
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?	No

4.1.	Were follow-up methods described and the same for all groups?	???
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%.)	No
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	No
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	No
5.	Was blinding used to prevent introduction of bias?	N/A
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.)	No
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
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 intervening factors described?	N/A
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	Yes
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?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
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?	???
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?	Yes
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?	N/A
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

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