

Citation:

Turunen AW, Verkasalo PK, Kiviranta H, Pukkala E, Jula A, Männistö S, Räsänen R, Marniemi J, Vartiainen T. Mortality in a cohort with high fish consumption. *Int J Epidemiol.* 2008 Oct;37(5):1008-17. Epub 2008 Jun 25.

PubMed ID: [18579573](#)

Study Design:

Cohort Study

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:

The purpose of this study was to assess the cause-specific mortality in a cohort of Finnish professional fisherman and their wives.

Inclusion Criteria:

- Fisherman wife was defined as a woman married to a fisherman at the time of the registration of the fisherman or later; identified from the Population Information System of the Population Register Centre.
- Fisherman were included as identified from the Professional Fisherman Register. Those that entered the register at least once between 1980 and 2002 were included as part of the study cohort.
- Comparison group was taken from the Statistics Finland's national cause of death data from 1980 to 2005.

Exclusion Criteria:

None specified.

Description of Study Protocol:**Recruitment**

National sample of 4487 fisherman and their wives; recruitment methods not described.

Design: Cohort study

- A health questionnaire and health examination was completed. The health examination

protocols for the Health 2000 survey and the Fisherman's study were similar.

- Diet data was assessed by a validated self-administered semi-quantitative 128 item food frequency questionnaire (FFQ) that was designed to cover the diet over the preceding 12 months. Dietary data was processed using the Fineli (Finnish food Composition Database).
- Fasting blood samples were conducted during the health examination. Serum concentrations of nutrients (fatty acids, vitamin D 25 hydroxy-cholecalciferol) and environmental contaminants (17 dioxin and 37 PCB congeners).
- The Health 2000 survey did not have serum contaminant data therefore the results from the National Public Health Institutes case-control study on soft tissue sarcoma was re-calculated for this comparison (1997-1999). The follow up began in the year after the first registration as a fisherman and at marriage for the wives if after the fisherman was registered.

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

- Mortality study calculations for person years started at the beginning of the year after the first registry (1981 to 2002) and at marriage for the wives.
- Follow up ended at death, emigration, or on December 31, 2005 whichever came first.
- Number of deaths and person years at risk were calculated by gender and 5 year age groups during 4 calendar periods (1980-86, 1987-93, 1994-99, and 2000-05).
- Standard mortality ratios (SMR) were calculated at the ratio of observed to expected deaths with 95% CI and based on Poisson distribution for observed deaths.
- Means were calculated for nutrients and environmental contaminants and calculated separately for gender.
- The remaining variables (BMI, smoking, frequency of hangovers and physical activity) were divided into 3 categories.
- Age adjusted estimates for prevalence were calculated for BMI (<25, 25-29, >30 kg/m²), smoking (never, occasional or former, daily), frequency of hangover (none, 1-6, >6), physical activity at free-time (≥ 4 times/week, 1-3 time/week, ≤ 3 times/ month).

Data Collection Summary:

Timing of Measurements

The follow up started in the year after the fisherman registration and at marriage for the wives.

Dependent Variables

- Mortality rates
- Overall mortality: all cases, cerebrovascular diseases, and ischemic heart disease

Independent Variables

- Fish consumption: using FFQ, times per week
- Nutrients: fish derived omega-3 PUFA (g/day), alcohol intake (ethanol % of total energy); serum samples EPA % of fatty acids, DHA % of fatty acids, vitamin D (nmol)
- Environmental contaminants: PCBs (WHO_{PCB}TEQ, pg/g fat); dioxin (WHO_{PCDD/F}TEQ, pg/g fat)

Control Variables

- Lifestyle habits frequency of hangovers (% in last year none, 1 - 6/last year, >6 hangovers/last year)
- Physical activity: exertion at work (% heavy, moderate, mainly sedentary) and times per week outside of work (% ≥ 4 times/week, 1-3 times/week, ≤ 3 times/week)
- Smoking history (% never, occasional or former, daily)

Description of Actual Data Sample:

Initial N: 6410 fisherman, 4260 fisherman's wives. Life habit study: 4487 fisherman, their wives and other family members. 1429 responded, 309 attended the health examination (n=88 fisherman and 94 fisherman wives) and compared to Health 2000 health examination survey (n=6986). From the supplemental study on cardiovascular disease and diabetes (n=1526) was used for comparison; 313 males and 361 females, aged 45-74.

Attrition (final N): not applicable

Age: range < 20 to 80, majority between 30 to 59 years of age

Ethnicity: not described

Other relevant demographics:

- Fisherman and their wives had lowered prevalence of daily smoking (fisherman 17% wives 12%; health survey men 25% women 16%) and frequency of no hangovers (fisherman 45% wives 79%; health survey men 39%, women 73%)
- Physical exertion at work was higher for the fisherman as compared to the men of the health study (fisherman 61% health survey men 31%) but the exercise ≥ 4 times/week prevalence was lower (fisherman 18%; health survey men 28%)

Anthropometrics

- Fisherman and their wives BMI ≥ 30 (30%)
- Health survey (men 24%, women 25%)

Location:

South-western sea coast of Finland + 20 km from the Finnish coastline.

Summary of Results:

Key Findings

- The average fish consumption and serum concentrations of fish-derived fatty acids and environmental contaminants were higher among the fisherman and their wives than among the general population from the same region
- Fisherman and their wives exhibited a lower mortality for all causes (SMR 0.78, 95% CI 0.73-0.82 fisherman, 0.84, 0.76-0.93 wives) as well as ischemic heart diseases (SMR 0.73, 95% CI 0.65-.81 fisherman, 0.65, 0.50-0.83 wives) than the general population.
- Mortality from cerebrovascular diseases and malignant neoplasm was decreased among fisherman (SMR 0.67, 95% CI 0.52-0.85 and 0.90, 0.80-1.01 fisherman only) but not their

wives

Other Findings

- The fisherman's wives consumed 45% more fish and 29% higher amount of fish derived omega 3 PUFAs than those females in the health survey.
- Serum EPA was 67% higher, DHA concentration was 2x greater and vitamin D concentration was 30% higher for the fisherman's wives than the women in the health survey.
- When comparing the females of the Sarcoma study to the fisherman's wives environmental contaminants, the fisherman's wives PCBs in serum fat and dioxins were 30% greater than those in the Sarcoma study.

Author Conclusion:

The Finnish fisherman and their wives are generally a population with high fish consumption as well as high serum concentrations of dioxins and PCBs. Despite the high serum levels of environmental contaminants in the fisherman and their wives blood, they have a lower mortality from all causes, ischemic heart diseases and respiratory diseases than the general population. Therefore it appears that the health benefits of the fish out weigh the potential risks or negative health effects.

Reviewer Comments:

Diet assessed only at baseline. No data on confounding factors, such as diet, smoking, alcohol consumption and physical activity.

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?	N/A
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?	N/A
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?	N/A
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?	N/A
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?	No
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.)	N/A
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?	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?	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?	???
7.1.	Were primary and secondary endpoints described and relevant to the question?	N/A
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?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	???
8.1.	Were statistical analyses adequately described and the results reported appropriately?	No
8.2.	Were correct statistical tests used and assumptions of test not violated?	???
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)?	No
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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