

Health and seafood consumption

-An empirical investigation of consumption behavior among Norwegian women 45-69 years

By

Torbjørn Trondsen

Norwegian College of Fishery Science

University of Tromsø

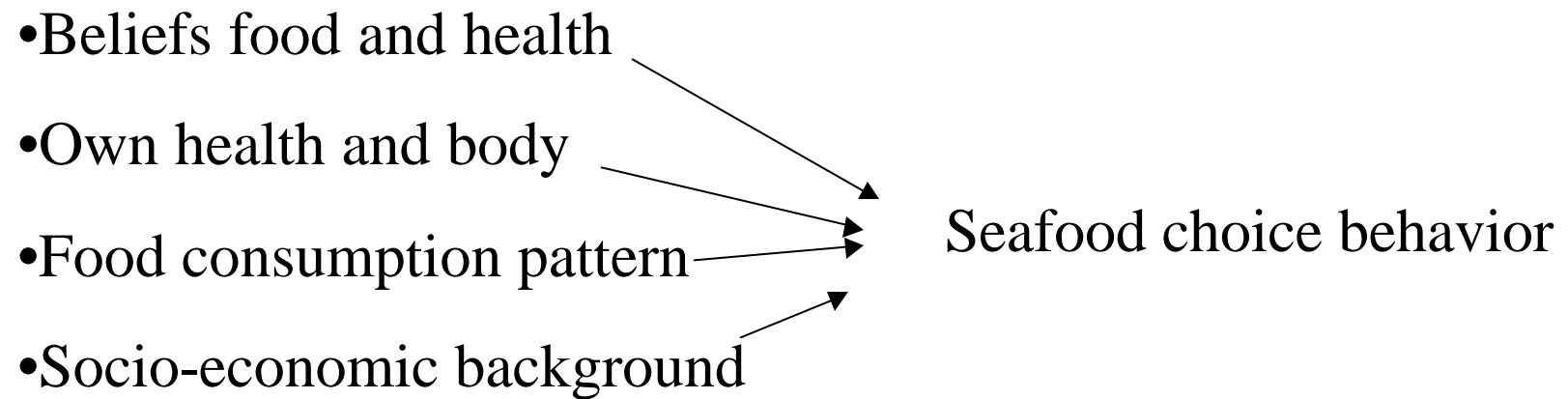
<http://fishmarketing.com>

Research questions

- Do health considerations influence fish consumption if adjusted for socio-economic and lifestyle factors?
 - We know from earlier studies that fish is perceived as healthy food
 - We know less about how this knowledge influences food choice behavior if adjusted for other factors

Model

Barriers —————→ Choice



The study

- Joint study
 - Epidemiological: The Norwegian Women and Cancer Study
 - Marketing: Seafood Consumption Study
- Advantages:
 - Cost sharing and high response rate (54.0%)
 - Combination health and seafood data
- Disadvantage
 - Theoretical compromises in questioning

Market segment

- Norwegian women 45-69 years
 - 51% live in Northern Norway
 - (7.5% of the Norwegian population live in N. Norway)
 - Heavy fish eaters
 - 13.2 dinners fish per month (3 pr week)
 - 2.2 meals fat fish
 - 6.4 meals lean fish
 - 4.7 meals processed fish (cakes, sticks etc.)
 - 8.5 meals meat per month
- Fish market segments as dependent variables:
 - Fish twice a week; Mean 76%
 - Fat fish once a week; Expanding market, mean 24%
 - Lean fish once a week; Traditional market, mean 73%
 - Processed fish once a week; Traditional market, mean 65%

Data

- Questionnaire to 31,387 women 45-69 year
 - Sampled from the National population register
- 16,963 questionnaire filled out and returned (54.0%)

Health Variables

- Health-Food beliefs (3 variables)
 - Perception of own health (Mean: 11% Bad+)
 - Importance of food for health (Mean: 78% Important+)
 - Wants to reduce weight (Mean: 53%)
- Own health status (7 variables)
 - Diagnosis of Diabetes (Mean: 2%)
 - Diagnosis of Migraine (Mean: 22%)
 - Regular user of hart medicine (Mean: 15%)
 - Regular user of pain relievers (Mean 9%)
 - Physical activity (Mean: 45% middle+)
 - Smoking (Mean: 30%)
 - Body Mass Index (BMI) (Mean: 42% 25+)

Consumption Variables

- Experience Attitude: Enough fish (Mean: 62 % yes)
- Fish (4 variables)
 - Fat fish (Mean: 24 % 1+/week)
 - Lean fish (Mean: 73% 1+/week)
 - Processed fish products (Mean: 65% 1+/week)
 - Shellfish (Mean: 2% 1+/week)
- Healthy food pattern (6 variables)
 - Fat spread on bread (Mean: 74% yes)
 - "Five a day" (vegetable/fruit) (Mean: 16% yes)
 - Plant oil in food making (Mean: 4% yes)
 - Food supplement (Mean: 27% daily)
 - Drinking fish oil (Mean: 36% daily)
 - Drinking wine (Mean: 22% 1+/week)
- Other food pattern (5 variables)
 - Meat (Mean: 57% 1+/week), Processed meat (Mean: 58% 1+/week)
 - Pizza (Mean: 11% 1+/w),Rice/pasta (Mean: 18% 1+/w), Porridge (Mean: 20% 1+/w)

Socio-economic variables

- 32 variables
 - Age
 - Household income
 - Grow-up region
 - Living region
 - Fish consumption as kid (Mean: 56% 3+/week)
 - Education length
 - Household size
 - Kids in the household

Statistical analysis

- Logistic regression
 - Estimated:
 - Δ CHI-SQ: Contribution of Chi.Sq on block of variables
 - Odds Ratio. Variable influence all other constant
 - Delta probability $\Delta P(y=1)$: Variable influence, all other variables constant on its middle value
 - Model prediction
 - Cox and Snell R^2 (pseudo R^2)

Results

| | FISH 2/W | FATFISH 1/W | LEANFISH 1/W | PROCFISH 1/W |
|----------------------------------|----------|-------------|--------------|--------------|
| | Δ CHI-SQ | Δ CHI-SQ | Δ CHI-SQ | Δ CHI-SQ |
| FOOD-HEALTH BELIEFS | -2.3% | -4.3% | -1.8% | -0.8% |
| OWN HEALTH AND BODY STATUS | -0.8% | -1.9% | -0.6% | -1.7% |
| FISH EXPERIENCE ATTITUDE | -58.9% | -8.8% | -65.5% | -19.9% |
| FOOD CONSUMPTION PATTERN | -17.1% | -55.4% | -11.8% | -42.6% |
| SOCIOECONOMIC BACKGROUND | -21.0% | -29.7% | -20.3% | -35.1% |
| SUM CHI-SQ | 2227.88 | 909.9 | 2313.46 | 1028.65 |
| | -100% | -100% | -100% | -100% |
| OBSERVATIONS | 9562 | 9562 | 9562 | 9562 |
| COX & SNELL R ² | 0.208 | 0.091 | 0.215 | 0.102 |
| PREDICTED | 78.93% | 77.82% | 77.41% | 68.36% |
| *p<=0.05, **p<=0.01, ***p<=0.001 | | | | |

Health more important for fish consumption of fat fish than lean and processed fish
 Lean fish and processed fish market saturated (Average once a week)

Health variables and fish consumption

| | FISH 2/W | | FAT FISH 1/W | | LEAN FISH 1/W | | PROCESSED FISH 1/W | |
|-----------------------------------|----------|------|--------------|-------|---------------|-------|--------------------|--------|
| | OR | Δ P | OR | Δ P | OR | Δ P | OR | Δ P |
| FOOD-HEALTH BELIEFS | | | | | | | | |
| Own health bad or very bad | 1.26* | 3.1% | | | | | | |
| Food important for health | 1.36*** | 4.0% | 1.28*** | 4.4 % | 1.37*** | 4.6 % | | |
| Wishes to reduce weight | | | | | | | | |
| OWN HEALTH AND BODY STATUS | | | | | | | | |
| Migraine diagnosis | | | | | | | 1.14* | 2.8 % |
| Diabetes diagnosis | | | | | | | | |
| Hart medicine user | | | 1.18* | 2.9 % | | | | |
| Pain reliever user | | | | | | | | |
| Bmiu20 | | | | | | | | |
| Bmio25 | | | | | | | | |
| High physical activity | | | | | | | | |
| Smoking now | | | 1.27*** | 4.2 % | | | 0.89* | -1.5 % |

“Food is important for health” → more fish eating

Hart medical treatment → more fat fish eating

Migraine → more easy prepared processed fish eating

Smokers eat more fat fish

Food and health beliefs

- No significant relationship between
 - beliefs about food and health and processed fish for dinner
 - Wishes to reduce body weight and fish for dinner

Healthy Consumption pattern and fish consumption

| | FISH 2/W | | FATFISH 1/W | | LEANFISH 1/W | | PROCESSED FISH 1/W | |
|---------------------------------|----------|--------|-------------|-------|--------------|-------|--------------------|--------|
| | OR | Δ P | OR | Δ P | OR | Δ P | OR | Δ P |
| FISH EXPERIENCE ATTITUDE | | | | | | | | |
| Enough fish | 4.99*** | 13.5 % | 1.90*** | 12.5% | 5.15*** | 15.5% | 1.68*** | 10.4% |
| FOOD CONSUMPTION PATTERN | | | | | | | | |
| <i>HEALTHY</i> | | | | | | | | |
| Fat on bread | 0.85** | -2.6 % | | | | | | |
| Five a day vegetables and fruit | 1.71*** | 6.5 % | 1.84*** | 11.9% | 1.44*** | 5.3% | 1.28*** | 5.3 % |
| Use vegetable oil for cooking | | | 1.64*** | 9.3% | | | | |
| Fish oil daily | 1.23*** | 2.8 % | 1.35*** | 5.3% | 1.25*** | 3.3% | | |
| Food additives daily | | | | | | | | |
| Wine weekly | | | 1.37*** | 5.6% | | | | |
| <i>OTHER</i> | | | | | | | | |
| Minced meat weekly | 1.97*** | 7.8 % | 1.48*** | 7.2% | 1.54*** | 6.1% | 2.35*** | 15.9 % |
| Meat weekly | 1.78*** | 6.9 % | 1.63*** | 9.1% | 1.78*** | 7.7% | 1.13* | 2.6 % |
| Pizza weekly | | | | | | | 1.18* | 3.6 % |
| Rice/pasta weekly | | | | | | | | |
| Porridge weekly | 1.20* | 2.5 % | | | | | 1.32*** | 5.9 % |
| Shellfish weekly | | | 1.69*** | 9.9% | | | | |

- The more “Enough fish”, ”Five a Day”, minced meat and meat, the more all kind of fish dinners
- The more fish oil, the more both fat and lean fish dinners
- Pizza, and porridge are related to more easy prepared processed fish
- Shellfish is positively related to more fat fish dinners

Strong socioeconomic influence

- The higher age, the higher total consumption of fish and of both lean and fat fish
- High fish consumption as kid, the more total consumption of fish and both lean fish and processed fish dinner
- The higher income, the less total consumption of fish dinners and processed fish dinners
- Growing up on the West, Mid and North Coast or live in the north, the less consumption of to fat fish

Education and household size

- High school education level has a weak influence on higher fat fish consumption
 - University no influence:
 - as an opposite to age group 30-45
- Household 2+ more fish dinner (lean and processed) than Single households
 - Decreases with household size
- Kids (0-12 years) in household increases the consumption of processed fish

| FISH TWICE A WEEK | | |
|--------------------------------------|------------|-------------------------|
| | ODDS RATIO | $\Delta \text{Pr}(y=1)$ |
| Eat enough fish | 5.09*** | 13.70 % |
| Lives in northern Norway | 2.04*** | 8.17 % |
| Minced 1/ week | 1.93*** | 7.71 % |
| Age 65-69 | 1.88*** | 7.44 % |
| Meat 1/ week | 1.82*** | 7.17 % |
| "Five a day" | 1.69*** | 6.44 % |
| Fish 3/ week or more as a kid | 1.69*** | 6.44 % |
| Age 60-64 | 1.54*** | 5.47 % |
| Household 2 | 1.53*** | 5.41 % |
| Lives in western and mid Norway | 1.40*** | 4.40 % |
| Food is important for health | 1.39*** | 4.28 % |
| Household 3 | 1.36*** | 4.02 % |
| Household 4 | 1.31** | 3.65 % |
| Age 55-59 | 1.30*** | 3.56 % |
| Fishoil 1/ day | 1.27*** | 3.23 % |
| Own health bad or very bad | 1.23* | 2.77 % |
| Porridge 1/ week | 1.22** | 2.72 % |
| Income in household 150'-300' NOK | 0.85* | -2.53 % |
| Fat on bread | 0.84** | -2.65 % |
| Income in household 301'-450' NOK | 0.82* | -3.02 % |
| Income in household 451'-600' NOK | 0.78* | -3.94 % |
| Income in household 601' NOK or more | 0.68** | -6.40 % |
| COX & SNELL R ² | 0.202 | |
| PREDICTED | 79.31 % | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

| FAT FISH DINNER 1/WEEK | | |
|---|------------|-----------------|
| | ODDS RATIO | $\Delta P(y=1)$ |
| Eat enough fish | 1.90*** | 12.68 % |
| Shellfish 1/week | 1.93*** | 13.10 % |
| "Five a day | 1.83*** | 11.90 % |
| Vegetable oil for cooking | 1.73*** | 10.64 % |
| Grew up abroad | 1.64* | 9.50 % |
| Meat dinner 1/week | 1.63*** | 9.31 % |
| Minced meat dinner 1/week | 1.42*** | 6.46 % |
| One glass wine 1/week | 1.34*** | 5.36 % |
| Age 65-69 | 1.34*** | 5.38 % |
| Fish oil 1/day | 1.33*** | 5.26 % |
| Food important / very important for health | 1.29*** | 4.58 % |
| Age 60-64 | 1.27*** | 4.31 % |
| Live in the south -east ex. Oslo and Akershus | 1.26** | 4.14 % |
| Medicine for cardiovascular disease | 1.28*** | 4.47 % |
| Smoking today | 1.27*** | 4.23 % |
| Education is between 10 and 12 years | 1.11* | 1.87 % |
| Grew up in the middle or west | 0.83** | -3.04 % |
| Household size is 5 or more | 0.71** | -5.29 % |
| Lives in northern regions of Norway | 0.52*** | -8.97 % |
| COX & SNELL R ² | 0.084 | |
| PREDICTED | 77.28 % | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

| LEAN FISH FOR DINNER ONCE A WEEK | | |
|--|------------|-------------------------|
| | ODDS RATIO | $\Delta \text{Pr}(y=1)$ |
| Enough fish | 5.21*** | 16.10 % |
| Age 65-69 | 2.10*** | 9.72 % |
| Lives in northern regions of Norway | 1.92*** | 8.34 % |
| Meat dinner 1/ week | 1.77*** | 7.92 % |
| Fish 3/ week or more as a kid | 1.68*** | 7.32 % |
| Age 60-64 | 1.65*** | 7.10 % |
| Household 5 | 1.62*** | 6.88 % |
| Household 2 | 1.57*** | 6.51 % |
| Minced meat dinner 1/ week | 1.51*** | 6.02 % |
| Household 3 | 1.45*** | 5.46 % |
| Age 55-59 | 1.43*** | 5.30 % |
| Household 4 | 1.40*** | 5.07 % |
| 'Five a day' | 1.39*** | 4.93 % |
| Food important / very important for health | 1.35*** | 4.50 % |
| Fish oil 1/ day | 1.26*** | 3.51 % |
| Age 50-54 | 1.17** | 2.45 % |
| Income in household 601' NOK or more | 0.65*** | -7.88 % |
| COX & SNELL R ² | 0.203 | |
| PREDICTED | 77.62 % | |

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

| PROCESSED FISH ONCE A WEEK | | |
|--------------------------------------|------------|-----------------|
| | ODDS RATIO | $\Delta P(y=1)$ |
| Minced meat 1/ week | 2.28*** | 15.31 % |
| Lives in northern regions of Norway | 1.91*** | 12.55 % |
| Enough fish | 1.72*** | 10.82 % |
| Kids \leq 7 years | 1.70* | 10.57 % |
| Lives in western or mid Norway | 1.70*** | 10.60 % |
| Kids 8-12 years | 1.45*** | 7.68 % |
| "Five a day" | 1.30*** | 5.55 % |
| Porridge 1/ week | 1.28*** | 5.22 % |
| Household 4 | 1.26** | 4.90 % |
| Fish 3/ week or more as a kid | 1.26*** | 4.84 % |
| Grew in the northern counties | 1.24** | 4.66 % |
| Household 2 | 1.21*** | 4.04 % |
| Household 3 | 1.20** | 3.84 % |
| Meat dinner 1/ week | 1.19*** | 3.67 % |
| Grew up in the west or mid Norway | 1.16* | 3.26 % |
| Pizza 1/ week | 1.16* | 3.13 % |
| Migraine | 1.11* | 2.20 % |
| Smoking today | 0.90* | -2.40 % |
| Income in household 451'-600' NOK | 0.77*** | -5.90 % |
| Income in household 601' NOK or more | 0.71** | -7.97 % |
| COX & SNELL R ² | 0.098 | |
| PREDICTED | 68.55 % | |

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Discussion and Conclusion

- The study shows significant positive relationships
 - Total consumption of fish products and
 - Perception of "own health is bad or very bad "
 - Increasing age (ex.processed) and decreasing income (tot. and processed)
 - Lives in West and North and in household 2+
 - Consumption of all 3 kind of fish dinners
 - "Five a Day"
 - Fat and lean fish consumption and
 - Attitude "Food is important for health"
 - Consumption of "Fish Oil"
 - Fat fish in SE and Lean and processed in West and North
 - Fat fish consumption and
 - Hart medicine users and smokers
 - Processed fish consumption and
 - Smokers, migraine
 - Fast food complex:, Pizza, porridge and rice/pasta
 - Kids 0-12 years

Conclusion

- Significant barriers in:
 - Eating enough fish (Ave 3 times a week)
 - Socio-economics
 - Health important
 - Potential in seafood marketing and education