

Lake Ontario Sport-Caught Fish Consumption and Breast Cancer Risk in the New York State Angler Cohort Study (NYSACS)

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Environmental organochlorine compounds

- Organochlorines:
 - dioxins (PCDDs, 2,3,7,8-TCDD, bind the Ah-receptor).
 - furans (PCDFs, dioxin-like activity).
 - polychlorinated biphenyls (PCBs, 209 congeners, some dioxin like, some not).
 - pesticides (i.e. Mirex, HCB, DDT, etc.)
 - metabolites of the above (hydroxy-PCB's, methyl sulfonyl-PCB's, DDE, PCP, etc.).
- A large volume of *in vitro* and *in vivo* toxicologic evidence suggest possible associations between environmental organochlorines and adverse health effects
- Lake Ontario sport-caught fish have been contaminated above FDA tolerance limits with these compounds and no-eat consumption advisories have been in place since 1975

Great Lakes Area



Methods

- Randomly selected 30,000 licensed anglers aged 18-40 years from 16 counties
 - (weighted by proportion of licenses sold in each county)
- Mailed SAQ; two follow-ups
 - 39% males and 49% females responded
- Questions on consumption patterns, knowledge/compliance advisories, lifestyle, medical and reproductive history



Fig. 1. Sixteen county catchment areas for the New York State Angler Cohort Study.

NYSACS Catchment Area



2004-20

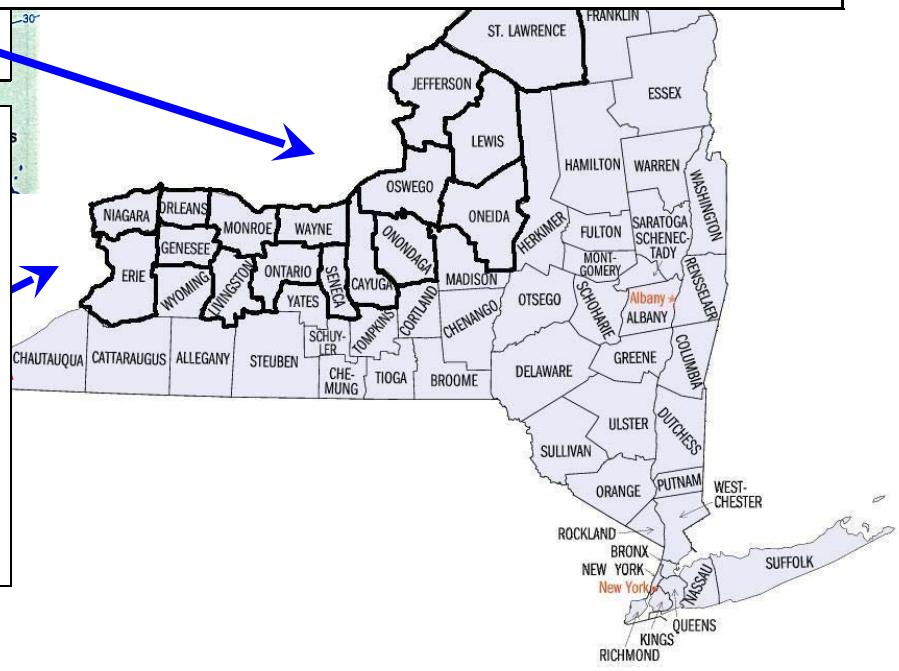
- ♀s chil
- ≤1 meal
- freshwat
- perch &
- All oth

1990-1991 NYS DEC: PCBs & mirex

- ♀s childbearing age, infants, & children <15 yrs. eat no fish species.
- All others eat no American eel, channel catfish, carp, lake trout, brown trout >20", chinook salmon, coho salmon >21", & rainbow trout >25".
- All others eat white sucker, brown trout <20", coho salmon <21", rainbow trout <21", & white perch.

2004-2005 NYS DOH: Dioxin, PCBs, mirex

- ♀s childbearing age, infants, & children <15 yrs. eat no fish species.
- All others eat no American eel, channel catfish, carp, lake trout >25", brown trout >20", chinook salmon, & white perch (based on locale).
- All others eat ≤1 meal/mos. white sucker, rainbow trout, lake trout <25", brown trout <20", coho salmon >25" & white perch (based on locale).





- Persistent organic pollutants, including hormonally active organochlorines, may play a role in breast cancer risk. Consumption of sport-caught fish is the major route of exposure to these compounds. We hypothesized that long-term consumption of sport-caught fish from Lake Ontario is associated with breast cancer.
- The NYSACS is a prospective cohort study of 11,431 licensed anglers 18-40 years of age in 1991 and 6,645 spouses who completed a baseline questionnaire. This analysis is restricted to 6,285 women which include female anglers (n=898) and the spouses of anglers (n=5,389) with complete exposure and outcome information. (In 2006: 33-55 years of age!)

Follow-up:

- Linkage with the NYS cancer registry identified 85 first primary incident breast cancers occurring between 1/1/1991-12/31/2006
- Vital status was ascertained by linkage with the Social Security Administration
 - Average length of follow up was 15.2 ± 2.1 years

Statistical Analysis:

- Cox proportional hazards models (CPH) estimated hazard ratios (HRs) and 95% confidence intervals (95% CIs)
- Age at the end of follow-up was used as the time scale
- HRs are adjusted for income, education, parity and recent live births
- Lagged exposure analysis for duration of consumption in quartiles: 5 & 10 years
- Species-specific analyses were conducted for consumption between 1990-1991

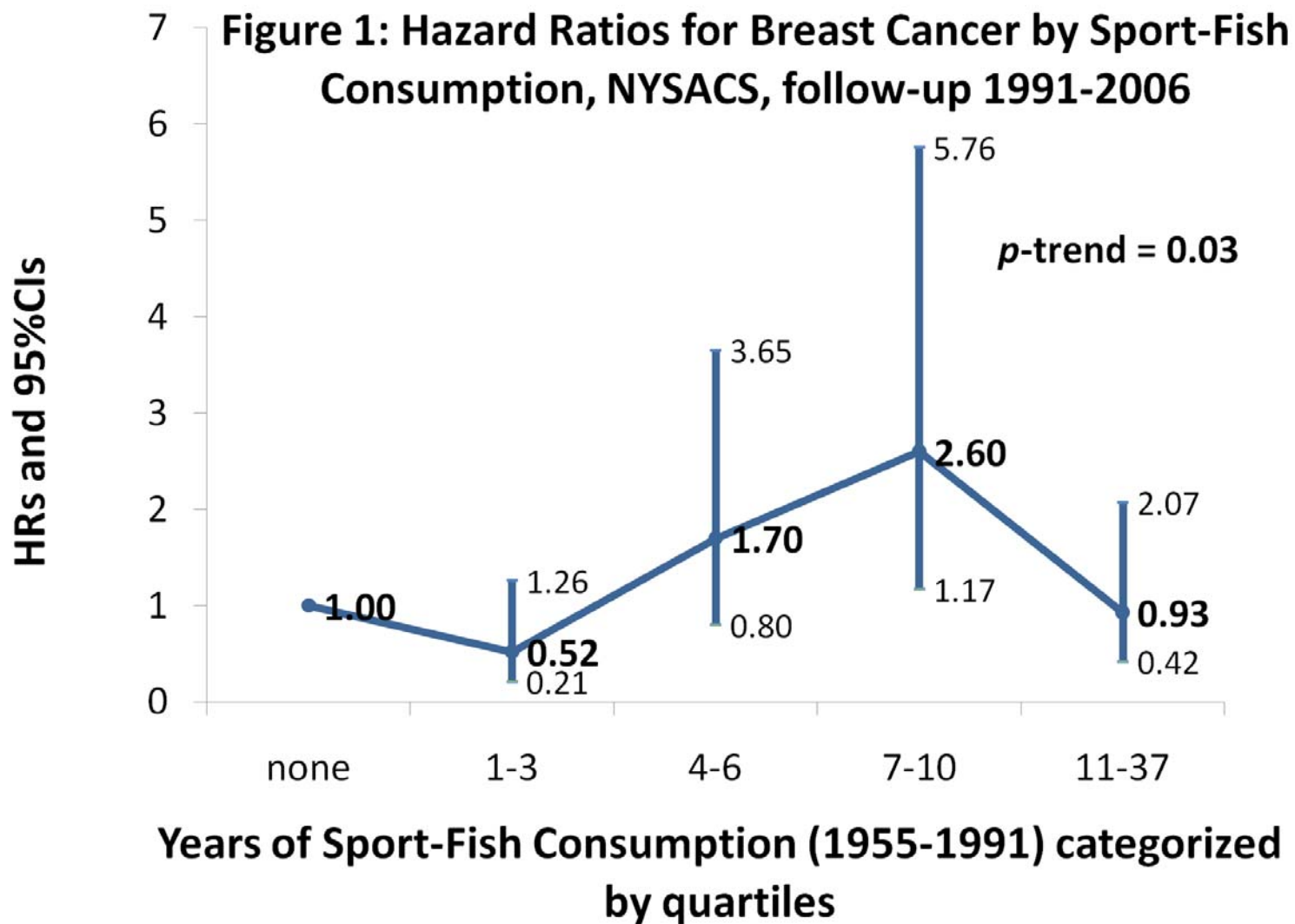


Figure 2: Hazard Ratios for Breast Cancer by Sport-Fish Consumption, NYSACS, follow-up 1991-2006

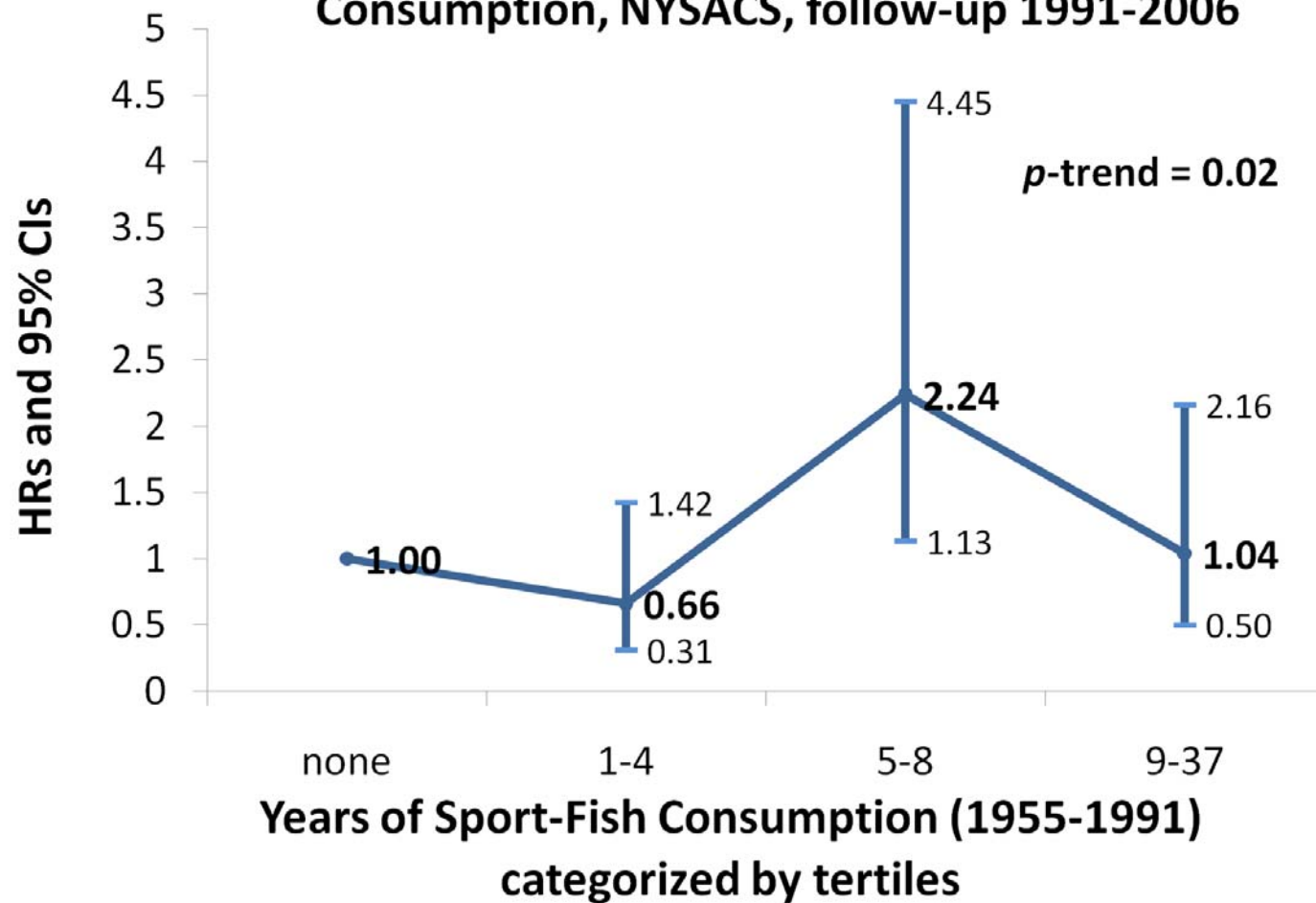


Table 2: Hazard Ratios for Breast Cancer by Duration of Sport-Fish Consumption Lagged by 5 and 10 years NYSACS, 1955-1991

| | 5-year lag | | 10-year lag | | |
|-------------|------------|-----------|-------------|------|-----------|
| | HR* | 95%CI | | HR* | 95%CI |
| None | 1.00 | Referent | None | 1.00 | Referent |
| 1-3 years | 1.44 | 0.68-3.06 | 1-3 years | 1.36 | 0.61-3.06 |
| 4-6 years | 3.49 | 1.65-7.40 | 4-6 years | 1.84 | 0.66-5.18 |
| 7-10 years | 2.07 | 0.80-5.36 | 7-10 years | 1.47 | 0.45-4.82 |
| 11-37 years | 1.04 | 0.40-2.70 | 11-37 years | 1.06 | 0.38-2.97 |
| p-trend | | 0.02 | p-trend | | 0.74 |

*Adjusted for education, income, parity, recent live births

Table 3: Hazard Ratios for Breast Cancer by Consumption of Specific Fishes, NYSACS, 1990-1991

| Characteristic | Crude | | | Adjusted* | | |
|-----------------------|-----------|------|-----------|-----------|------|-----------|
| | cases (n) | HR | 95%CI | cases (n) | HR | 95%CI |
| Catfish | | | | | | |
| Never | 62 | 1.00 | Referent | 53 | 1.00 | Referent |
| Ever | 4 | 2.57 | 0.94-7.06 | 4 | 2.99 | 1.08-8.33 |
| Chinook Salmon | | | | | | |
| Never | 54 | 1.00 | Referent | 48 | 1.00 | Referent |
| Ever | 12 | 2.07 | 1.11-3.88 | 9 | 1.74 | 0.85-3.57 |

*Adjusted for education, income, parity, and recent live births

- Preliminary analyses suggest there may be an association between sport-fish consumption and the risk of breast cancer in the NYSACS. However, the interpretation is complicated by the lack of a monotonic exposure-response gradient.
- Species specific analyses indicate that consuming catfish and chinook salmon may increase breast cancer risk among women in the NYSACS.
- Due to the small sample size and potential for exposure misclassification, these results should be interpreted with caution.
- Additional follow-up and analyses are ongoing to assist in clarifying these findings.



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