Vibration of effects in epidemiologic studies of alcohol consumption and breast cancer risk

Main takeaways

1. The majority of observational studies evaluating the impact of alcohol consumption on breast cancer report relative effect estimates for the same associations that **diverge by over 2-fold**.
2. Since the magnitude of an estimated effect is dependent on **different analytical approaches**, including choice of adjustments for covariates, exposure definitions, and study populations, **claims for observational associations should be cautious**.

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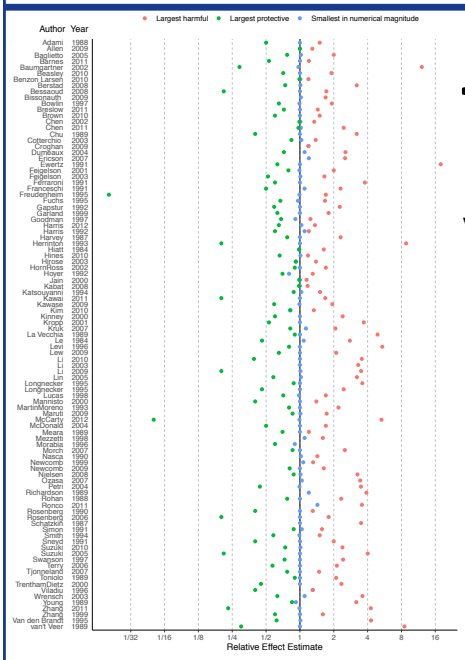
What we found



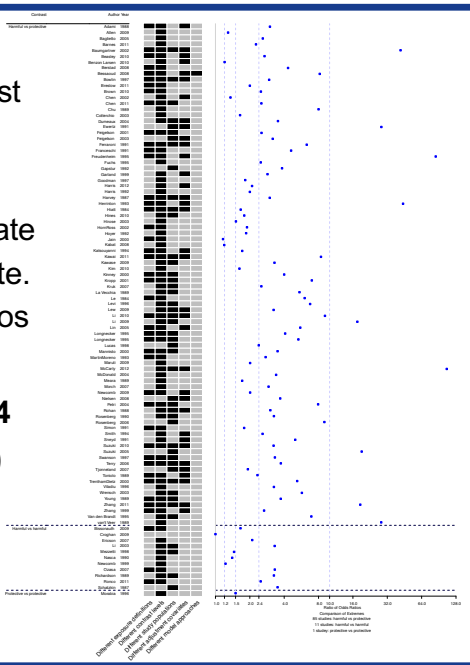
- **Sample:** 97 observational studies with at least one relative effect estimate on alcohol consumption and breast cancer.

Vibration ratio: Largest reported effect estimate divided by the smallest reported effect estimate. The ratio is estimated by the ratio of odds ratios (ROR).

- **65 of 97 (67.0%) studies had RORs > 2.4**
- **9 of 97 (9.3%) studies had RORs > 10.0**

Figure 1. Largest harmful, largest protective, and smallest (in numerical magnitude) relative effect estimates from all 97 eligible studies. X-axis in log scale.

Figure 2. Scatter plot of ratios of odds ratios from all 97 eligible studies with a map of model specification differences. Black squares indicate observed differences. X-axis in log scale.



What is already known

- Reported associations between **alcohol consumption** and **breast cancer** come from **observational studies**, which **do not ensure causality** and have innate **study design limitations**.
- The **association between alcohol consumption and breast cancer risk is unclear**, with some studies suggesting J-shaped, monotonically increasing, null, or weak relationships.
- Not all authors studying the same exposure-outcome relationships will use the same modeling approach.
- The variability of effect estimates due to these alternative analytical approaches has been referred to as the "**vibration of effects**".

What we did

- We approximated the **vibration ratio** by comparing the **extreme relative effect estimates** corresponding to broadly-defined alcohol exposure and breast cancer related outcomes for all studies included in the 2016 Global Burden of Disease, Injuries, and Risk Factors Study (GBD) meta-analysis.[1]
- We recorded whether the extreme estimates came from analyses with: (1) different alcohol **exposure definitions**, (2) different exposure **contrast levels,** (3) different breast cancer **subpopulations,** (4) different **adjustment covariates**, and/or (5) different **modeling approaches**.

1. The Lancet, 392(10152), 1015-1035.

What does it mean

Implications:

- Flexible analyses likely lead to vibrations of effects.
- Instead of presenting a single effect estimate for an association of interest, authors could consider presenting: (1) the median effect across all possible analyses using different adjustments, (2) a relative risk estimate comparing extreme effect estimates, (3) the pattern of the vibration of effects.

Limitations: We focused on the extreme reported estimates; Some vibration may reflect legitimate changes based on exposure definitions, inclusion of certain confounders, and/or subgroup differences.

Team

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Come find me!

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