# PHW250B Journal Club Assignment 5

Effect modification, matching, and screening

---

**Questions about Luby et al., 2018**

**Problem 1. Below is an excerpt from Table 6. Calculate the observed and expected stunting prevalence ratios for the water, sanitation, and handwashing arm and the nutrition arm. What do you conclude about interaction, and on which scale? (1-2 sentences)**

| | n/N (%) | Difference vs control (95% CI) | Difference vs washing, sanitation, and handwashing (95% CI) | Difference vs nutrition (95% CI) |
|---|---|---|---|---|
| **Stunting*** | | | | |
| Control | 451/1103 (41%) | .. | .. | .. |
| Water | 255/595 (43%) | 2·4 (–2·6 to 7·3) | .. | .. |
| Sanitation | 232/579 (40%) | –0·4 (–5·3 to 4·6) | .. | .. |
| Handwashing | 263/570 (46%) | 5·3 (0·2 to 10·3) | .. | .. |
| Water, sanitation, and handwashing | 232/579 (40%) | –0·5 (–5·5 to 4·4) | .. | .. |
| Nutrition | 186/567 (33%) | –7·7 (–12·4 to –2·9) | .. | .. |
| Water, sanitation, handwashing, and nutrition | 221/591 (37%) | –3·8 (–8·6 to 1·1) | –2·8 (–8·4 to 2·8) | 4·0 (–1·6 to 9·6) |

PR[WSH] = .4/.41 = 0.98
PR[N] = .33 /.41 = 0.80

observed joint PR [WSHN] = .37 / .41 = 0.9
expected joint PR = 0.98 * 0.8 = 0.8

The stratified prevalence ratios are equal to the crude/joint ratio, so we conclude that effect measure modification is absent on the multiplicative scale. There is no departure from multiplicity.

**Problem 2. Below is an excerpt from Table 6. Calculate the observed and expected stunting prevalence differences for the water, sanitation, and handwashing arm and the nutrition arm. What do you conclude about interaction, and on which scale? (1-2 sentences)**

| | n/N (%) | Difference vs control (95% CI) | Difference vs washing, sanitation, and handwashing (95% CI) | Difference vs nutrition (95% CI) |
|---|---|---|---|---|
| **Stunting*** | | | | |
| Control | 451/1103 (41%) | .. | .. | .. |
| Water | 255/595 (43%) | 2·4 (–2·6 to 7·3) | .. | .. |
| Sanitation | 232/579 (40%) | –0·4 (–5·3 to 4·6) | .. | .. |
| Handwashing | 263/570 (46%) | 5·3 (0·2 to 10·3) | .. | .. |
| Water, sanitation, and handwashing | 232/579 (40%) | –0·5 (–5·5 to 4·4) | .. | .. |
| Nutrition | 186/567 (33%) | –7·7 (–12·4 to –2·9) | .. | .. |
| Water, sanitation, handwashing, and nutrition | 221/591 (37%) | –3·8 (–8·6 to 1·1) | –2·8 (–8·4 to 2·8) | 4·0 (–1·6 to 9·6) |

PD[WSH] = .4-.41 = -0.01
PD[N] = .33 - .41 = -0.08

observed joint PD [WSHN] = .37 - .41 = -0.04
expected joint PD = -0.01 + -0.08 = -0.09

There is effect measure modification on the additive scale. The stratified prevalence risk difference does differ from crude/joint, so there is departure from additivity.

**Problem 3. In this study, what step would we need to take before calculating the relative excess risk due to interaction? (1-2 sentences)**

The first step is we should measure, quantify, and assess for potential impacts of confounding -- especially for unmeasured confounding variables that could be influencing the likelihoods of exposures and outcomes. We may also use a chi-squared test to make sure that the difference we see here in the PDs is statistically different.

**Problem 4. Under the potential outcomes / counterfactual model, what do the results of problems 1-2 indicate about the presence of causal interaction between these interventions? (1-2 sentences)**

Under the potential outcomes / counterfactual model, a departure from additivity implies the presence of causal interactive types in the population, which suggests that there is a biologic / causal interaction between the two exposures.

Based on a multiplicative interaction (or lackthereof) in problem 1, we cannot make any statements about interaction as a causal concept.

**Problem 5. Was any matching used in the WASH Benefits Bangladesh study design? Describe the nature of the matching. (2-3 sentences)**

Yes. They first used a geographical matching approach: matched sets of clusters of villages were created based on similar characteristics like having similar environmental and infrastructure-related conditions / proximity, etc. Within each matched set, the clusters were given an ID. Then, a statistician off-site (I think at Cal?) randomly assigned treatment based on the IDs.

## Questions about Reingold et al., 1989

**Problem 6. Describe the matching used in this study. (1-2 sentences)**

This study used age-matched friend controls and neighborhood-matched controls. For each TSS case, they were matched to two friend controls of a similar age and two other controls of similar age in the same neighborhood.

**Problem 7. In case-control studies, what is typically the primary reason to match cases to controls? (1-2 sentences)**

The primary reason is to get as close to a counterfactual framework as we can, importantly, to balance unmeasured characteristics and control for confounding at the study design phase so that we are more validly and confidently able to assess 'true' relationships between exposure and outcome of interest.

**Problem 8. Draw a DAG including nodes for the exposure and outcome in this study as well as age. Assume that age affects both toxic shock syndrome and tampon use. What do you conclude about the risk of overmatching on the variable age in this study? If overmatching is a concern, what would the result of overmatching be in this study? (2-3 sentences)**

I cannot get this thing to work -- also cannot figure out how to delete that box thing... I will append DAG to document.

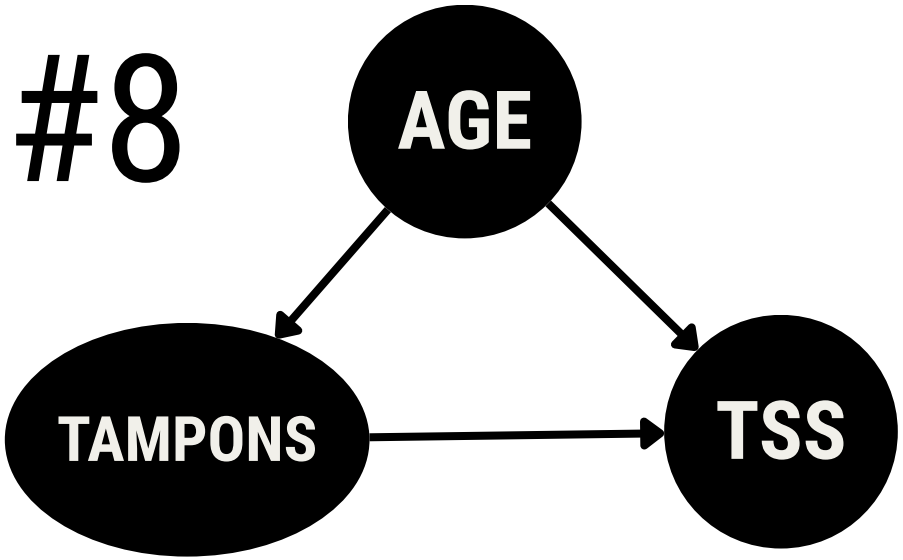
If age affects both the outcome and the exposure -- that means it's a confounding variable. By matching on age, this risk of overmatching here is relatively low and is a good way to reduce impact of this confounding. However, if age were disproportionately impacting one or the other (like if it is strongly related to tampon use and only marginally related to the outcome), it could bias our results toward the null, but since it's a confounder, it improves our validity overall.

**Problem 9. Now draw a DAG for a hypothetical study of tampon use and toxic shock in which investigators matched on hormonal contraception use. Assume that hormonal contraception use affects tampon use but not toxic shock syndrome. What do you conclude about the risk of overmatching on hormonal contraception use in this study? If overmatching is a concern, what would the result of overmatching be in this study? (2-3 sentences)**

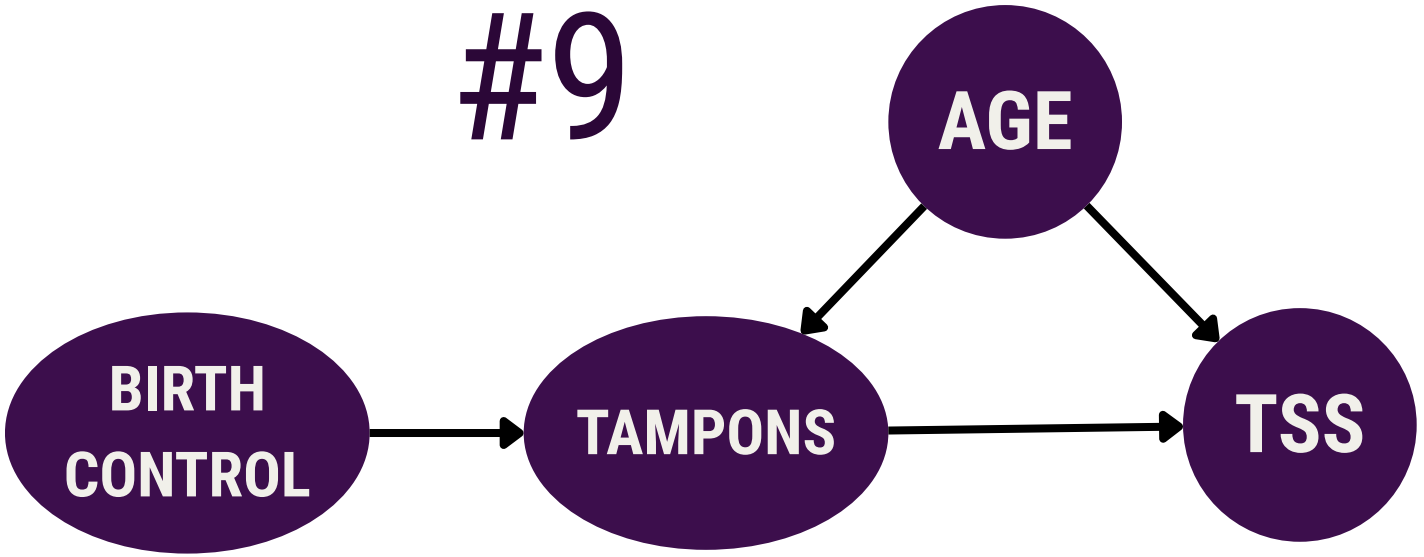
I cannot get this thing to work -- I will append DAG to document.

In this hypothetical, there would be risk of overmatching, since hormonal contraceptive use is associated with the exposure and not the outcome. If we further matched cases and controls by hormonal contraceptive use, then our cases and controls would have very similar tampon use, and thats the primary question here -- so we would likely not be able to detect an association between tampon use and TSS if there was one. This would bias our results toward the null.

#8




#9



**Problem 10. What formula for the odds ratio would be used in the study by Reingold et al. in a bivariate analysis of tampon use and toxic shock syndrome?**

They would need to use a special kind of OR that takes into account the matched pairs. This formula looks like: OR = b /c; where b is the number of pairs where the case uses tampons and the control does not, and c is the number of pairs where the case does not use tampons and the control does use them.