HW3

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Read the attached summary of an article by Block et al. as one of very few examples of a validity study that had close to a true measure of exposure, we assume that T=nutrient as measured by 24-hour dietary recalls (i.e. true exposure measurement) and X=nutrient as estimated by food frequency questionnaire (i.e. observed measurement). For this exercise, use estimates without adjustment for covariates and ignore the table footnotes that measures were log transformed.

1. Please refer to Table 2 in the article, what is the estimated bias of the food frequency questionnaire measure of total fat intake? of saturated fat? of dietary fiber? of vitamin A? (please calculate the bias for each nutrient) Does this generally suggest a pattern?

In table 2, there appear to be differential measurement (recall bias) depending on food take. Participants incorrectly underestimated their fat intake (at a statistically significant level), and though the difference was not large with unsaturated fat, they also generally underestimated slightly. With healthier foods, however (Vitamin A and dietary fiber), participants' recall and the food frequency questionnaire were relatively similar.

2. What is the estimated precision of the food frequency questionnaire measure of fat? of dietary fiber? (Refer to last column in Table 3 in the article)

The precision (referred to in this case as the correlation between to measures) is higher for fat (0.78) than dietary fiber (0.68).

What is the standard deviation of the food frequency measure of saturated fat? of the "true" measure of saturated fat? (refer to Table 2 in the article)

The standard deviation of the food frequency measure of saturated fat is 14.9, whereas the "true" measure of saturated fat is 12.1

How and why would these standard deviations differ (give a descriptive, not quantitative, answer)? Does this relationship hold for other nutrients?

The FFQ reflects a higher level of variance in the consumption of saturated fat. This is likely due to differential recall bias - participants' recall regression towards the mean is a result of social conformity and underlying beliefs/biases about healthy behaviors.

3. Using the reported standard deviation of the "true" measure of fat and the measure of the precision of the food frequency measure of fat (last column in Table 3), what would you expect the standard deviation of the food frequency measure to be (quantitative)? (See notes and recall that the standard deviation is the square root of the variance.) How close was this to the observed standard deviation from the food frequency measure?

The reported standard deviation of the "true" measure of fat is 30.6. The measure of the precision of the food frequency measure of fat is 0.78.

30.6 / 77.5 = 0.3948
sqrt(0.3948) = 0.628
Not really sure where to go from here. I understand that the precision estimate is related to the variance, but not sure how to show that mathematically.

4. Assume that the true odds ratio for the association of fat intake and stroke is 3 (for say a 30 gram increase in saturated fat intake). What odds ratio would you expect to observe in a case-control study of the relationship between the food frequency estimate of fat and stroke? Assume that there is non-differential measurement error. Repeat question for fiber.

Given that consumption of food is under-recalled, we would expect that the relationship between recalled consumption and true consumption would be on the order of 77.5 / 85.3 = 0.909. Therefore, the odds ratio of 3 would need to be adjusted to 3 / 0.909 = 3.302.

With dietary fiber, given the non-significant result of this study, one could argue that no adjustment is needed. That said, if we take the point estimates, dietary fiber's supposed relationship between recalled consumption and true consumption would be 22.5 / 22.8 = 0.986. I would need to know a starting odds ratio in order to adjust it for this bias.