**Responses to Unanswered Questions Asked During the Webinar**

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1.  **Can you speak to progress with inexpensive biomarkers for estimating dietary intake?**

    Unfortunately, biomarkers are not inexpensive. However, in addition to the recovery biomarkers of doubly labeled water, urinary nitrogen and urinary potassium; several concentration biomarkers are very useful, including carotenoids, tocopherols, vitamin C, and B vitamins. Efforts are underway to expand available biomarkers to sugars and fatty acids, but these remain complex.

2.  **If you want your FFQ to be valid for capturing usual intake over a certain period (e.g., diet over past year) is it essential to collect data from the referent method over that period? This is difficult sometimes when thinking through feasibility and only having 6 months for a validation study.**

    No, it is fine to specify the time period you want to cover. The advantage of one year is that it covers all the seasons. However, there are times when the purpose of your study requires a shorter time period. On the other hand, asking about the past month or week tends to be confusing in terms of actual memory vs pattern memory and this may have an effect on the data.

3.  **It seems most FFQs are validated based on nutrients, so is it appropriate to use FFQ data to estimate specific food or specific food group intake or food-based eating patterns?**

    Yes, in fact the most complex aspect of the FFQ is generating nutrients. It is very useful for understanding intake of food groups and eating patterns.

4.  **Can you comment on medication that participants may be taking that may affect nutrient absorption e.g. being on a statin? How do we control for this?**

    Several medications interfere with the link between dietary intake and biomarker measures. Important ones include statins for lipids and metformin for diabetes. The latter affects B vitamin status. Adjustment for these medications in analysis is best.

5.  **I am wondering how often these FFQs are updated. The food supply and dietary habits change over time.**

    You are correct, and this is a complex problem as you want to keep the instrument as stable as possible to measure change, but if key foods are missing this is more important. Most FFQs are not updated frequently but should be.

6. **Do any questionnaires account for seasonal changes in intake for people who buy primarily from farmers markets? Have we been inclusive of diverse populations in our research on dietary assessment? If not, what populations need more attention?**

   **Seasonal change is an important challenge. Many FFQs ask for intake of key seasonal foods in season and sometimes may also ask about the rest of the year. This is currently imperfect and can be improved.**

   To me the biggest issue with FFQ is the lack of inclusion of minority populations, be it ethnically or by eating pattern (e.g., vegan). Therefore, each study should carefully take a look at the population to be covered. Content should not only be based on the majority, but inclusion of dietary intake of key minority groups should be evaluated separately and then merged back into the final questionnaire.

7. **You pointed out problems with a single-day dietary assessment. What if the goal is to estimate the average intake for a group, to allow comparison to another group? Can a single measure on each person be adequate in that circumstance?**

   Yes, if the groups are sufficiently large, the mean of a single 24 hour recall that has been carefully conducted, is valid for comparing group means.

8. **I suspect that standard FFQs won't work well for a number of population subgroups. Isn't that where 24-hour recalls would have an advantage?**

   Absolutely, I would always start with 24 hour recalls with a new population subgroup. That information can then be incorporated into future FFQs, particularly with new technology that allows skip patterns.

9. **How valid is ASA24 for immigrant groups, non-English-speaking groups?**

   The ASA24 is open-ended, so as a 24 hour recall it is valid for those who are compliant and able to complete it if it is presented in a language they understand. My experience, however, is that it is best to interviewer administer questionnaires to low literate participants. As of now, the ASA24 is available in Spanish and has attempted to include foods and food names for various Latinx groups.

10. **Are there other initiatives underway to develop population specific FFQs similar to the Puerto Rican Health Study FFQ?**

    There likely are, but I am not aware of them.

11. **Does the national increase in obesity correlate with decreased smoking?**

    It does correlate, and there may be some causal relationship, but it is unlikely the major cause of the extreme rapid escalation in obesity prevalence.

12. **Can you talk more about the systematic error in using a FFQ and how to mitigate this error by using statistical modeling?**

    The systematic error from missing foods or major misestimations of portion sizes or recipes for foods frequently consumed by subgroups cannot be mitigated with statistical modeling. Some systematic error has been identified by sex, BMI or other characteristics, which have been modeled to improve estimates, but this needs to be evaluated very carefully.

13. **What dietary method would you recommend for a new randomized trial to evaluate an intervention to increase fruit and vegetable intake in adults? And what if you were doing the study in primary school children? Or in adolescents?**

    It depends in part on how long the randomized trial will last. For short trials, the FFQ can be confusing, in which case, I would recommend 2-3 recalls before and after the trial. For longer trials, an FFQ can be useful with adults. In primary school children or adolescents I would feel safer with multiple interviewer administered recalls before and after, as there is a tendency to report what was served rather than consumed and this can overestimate intake unless specifically probed for.

14. **What dietary method would you recommend for a new cohort study?**

    It depends on the population to be covered. If already covered by an existing validated FFQ, I would select this. If it contains diverse groups, I would first see if data from 24 hour recalls are available for all the key groups. If so, by examining the key foods contributing to nutrients, portion sizes and recipes separately by group, a new FFQ could be developed. If not, I would start with multiple recalls to gather this information.

15. **How can new technology help us to improve our dietary assessment? For example, using the camera on our cell phone to take before and after pictures of each meal.**

    A lot of hope was places on photos, but this has not materialized, except in the case of improving portion estimation. For example, a photo of a soft drink will not tell you if it is diet or sugared. A photo of a mixed dish will not tell you the fat content. There is no way of avoiding self-report, but these technologies can be combined to improve precision.

16. **How can dietary assessment best be applied for personalized nutrition recommendations?**

    The methods we currently use are fine to start with, as long as subgroups are properly represented. A major issue is improving estimation of quality beyond food groups, which will require new technology to rapidly get to more details of frequently consumed foods by individuals to get more precise information on fat, sodium and nutrient content. One idea is to have participants scan barcodes on frequently consumed items in the home to get that detail.

**17. How can we improve precision in FFQ estimates?**

For any large study, it is important to think carefully about the participants and their variation in dietary patterns to be sure they are well covered. In the current US population, it is important to not just use an FFQ off the shelf without this consideration. Whenever possible, inclusion of multiple recalls with a subset of study participants, along with biomarkers, will help in assessing validity. Efforts at statistical calibration also fall short with respect to this diversity. It is best to carefully tailor the instrument than to try to "fix" errors after the fact.