Morning Day 2
https://youtu.be/2RnX37Xoz18

Jackie Haven: Good morning, good morning, everyone. Welcome to day 2 of the Dietary Guidelines Advisory Committee meeting, live from Houston, Texas. My name is Jackie Haven. I'm the Deputy Administrator for USDA's Center for Nutrition Policy and Promotion, and it's my pleasure to introduce the Deputy Undersecretary for USDA's Food Nutrition and Consumer Services, Brandon Lipps.

It is my pleasure to introduce him, and just for background, FNCS, Food Nutrition and Consumer Services, works in hunger and improve the health of the US as it administers federal domestic nutrition assistance programs and links scientific research to nutrition needs of consumers through science-based dietary guidance, nutrition policy coordination, and nutrition education. Mr. Lipps.

Brandon Lipps: Thank you, Jackie. Good morning.

Audience: Good morning.

Brandon Lipps: That was good.

[0:00:56] Jackie, thanks for the kind introduction. Welcome, everyone, to the fourth meeting of the 2020-2025 Dietary Guidelines Scientific Advisory Committee. I'm here on behalf of USDA, specifically Food Nutrition and Consumer Services and my colleague, Dr. Scott Hutchins from ARS, and our partners at the Department of Health and Human Services.

It is good to be back in my home state. People regularly say to me, "Are you going to get to see your family while you're home?" I am in my home state, but I am 532 miles from home. So, those of you from smaller states, you don't understand, but I'm not going to see my family while I'm here.

Given the second opportunity for public to provide comments to the committee, it was very important to Secretary Purdue that we get out of the beltway of Washington, DC. This is the first time in decades that the public has had an opportunity to comment on the *Dietary Guidelines* outside of the work that we do in the beltway in DC, and the important decisions that are informed by the work of this committee for the American public every day.

[0:02:15] We're grateful to the folks here at the Children's National Research Center for allowing us to hold this important meeting here. A little background on where we are and the important public/private partnership that has made today possible.

USDA's Agricultural Research Service and the Baylor College of Medicine have had a long shared interest in public health issues. I brought—I saw on the way in, hopefully you all saw this, but I brought a little prop so that we can remember what the important work of the Children's National Research Center is about the children, and they have this wonderful little pen that you can sit on your desk and wiggle. It's a good distraction from my remarks this morning, so I brought it for everybody.

[0:02:55] This partnership between government and the private sector is another example of how combined intellectual power increases our capacity to address and potentially solve important nutritional challenges.

Thank you again to Children's National Medical Center, Dr. Beer and his colleagues at the Baylor University College of Medicine, for hosting us today, and for being a willing partner in allowing the committee to again hear from the American public.

Can the webcast hear this microphone okay? They can? Okay, good.

We're also happy to see professionals and students from the Texas Medical Center and the greater Houston area registered for the meeting today. Thank you to each of you for joining us.

To the medical students here today, I hope that you are impressed both by the time and effort that this committee has put forward to help inform the significant government policy and the importance of your participation in the formation of government policy as your career progresses.

Last night, I had the opportunity—excuse me—to visit with a student who traveled here today to watch the important work of this committee.

[0:03:59] We need more people to get involved in the public policy-making process earlier in their careers to ensure that we have people willing to dedicate the time that these wonderful individuals have as they progress in their careers.

To the committee, I say this every time we're together, y'all do all of the hard work, I follow you around and say, "Thank you," and I'm here to do that again today. Thank you for continuing to dedicate your scientific expertise and time to the important phase of reviewing the current body of evidence to answer the questions that we have asked of you.

As we saw yesterday, you have your hands full reviewing the evidence. Your work to conduct this rigorous, robust, and independent scientific review is critical to informing the work of USDA and HHS as we prepare for the next edition of the *Dietary Guidelines*.

I also want to thank the committee for including time to hear directly from members of the public this afternoon. Past *Dietary Guidelines* have traditionally heard in-person oral comments only once at the beginning of their scientific process.

[0:05:01] This is the first time that the public will have an additional opportunity to provide comments in person to the Dietary Guidelines Advisory Committee.

I want to make sure that the public understands that this is a volunteer committee of experts who are very busy in their professional lives with very important work and have volunteered their time to come help, and they all, overwhelmingly and happily, agreed to have a second in-person session to hear directly from the public.

They have a difficult job with a lot of evidence to review. They're spending a significant amount of time making sure that they're getting that right and that they are taking the proper steps necessary to inform this process.

So, with that, let's give the committee a round of applause for their dedication and hard work.

[Applause]

Brandon Lipps: To the folks here in Houston and those joining us by webcast, thank you for your participation in our multi-year process to develop the guidelines.

[0:05:58] As you continue to follow the committee's deliberations today, I think you'll see first-hand that, as we noted, this is no small undertaking.

Again, I hope you'll have an appreciation for how much the committee is putting into its work to review the science, to address our topics and questions.

For those not able to provide oral public comments here today, just a reminder. There is an ongoing open period for public comments to the committee that started in March of last year and will close when the committee submits its scientific report in May of this year to USDA and HHS.

So, don't be shy. There's time for you to submit written comments. We review each and every one of those and provide a summary of them to the committee as they continue their work, and your input and participation is important to this process.

Again, I cannot thank the committee enough for their work on this very important process and for their willingness to travel to Houston to meet today. We are excited to be here in Houston with you all.

[0:06:56] Before I turn the meeting over to begin their important work, I want to take a moment to pause and thank my colleagues at USDA and our colleagues at the Department of Health and Human Service for their tireless work in support of this committee. Every time I have a chance to interact with the committee, the first thing they say to me is "Hello." The second thing they say is "I want to tell you how wonderful the staff at CNPP and ODPHP are in support of what we have to do and the big task that we have."

I know that. I get the wonderful opportunity to work with these individuals on a daily basis, but I know that the work that they're putting in support of the committee, I appreciate your recognition for that.

If you are a staff in support of this process, would you stand and let us give you a round of applause, please? Jackie?

[Applause]

[0:07:59] ***Brandon Lipps:*** With that—excuse me—with that, we will get on with the work of day 2, and I will now turn it over to the chair of the 2020 Dietary Guidelines Advisory Committee, Dr. Barbara Schneeman, to get day 2 started. Thank you.

[Applause]

Dr. Barbara Schneeman: Great. Thank you so much for those comments. And again, as the committee, on behalf of the committee, we also extend our appreciation to the Children's Nutrition Research Center, the ARS Center here, for hosting this meeting.

And we'll echo the wonderful staff support and how much we appreciate the staff's support for the work that is being done.

So, I'm going to just go through a few slides to get us started with today's meeting.

So again, we want to just describe the status and provide updates on the work of the committee up to this point.

[0:09:00] And we had draft conclusions for approximately 30 questions that are being presented during this two-day meeting, including the NESR systematic reviews and data analysis, and these draft conclusions have been drafted by the subcommittees, and then are being brought to the full committee for discussion at the public meeting.

Those systematic review conclusions will be posted online after going through peer review, and again, I remind you that they are considered draft until the committee submits its report to the Secretaries.

And I though it would be worthwhile to just also comment that I think, as we're looking at what was presented yesterday and what we'll be seeing today, we're primarily focused on summaries of the evidence that the subcommittees have been working on, and I think in some of the reports yesterday, you began to see a little bit of a hint at the detail that the subcommittees are working at in terms of how closely they look at the nature of the studies that come forward, the study design, the interpretation, the confounders.

[0:10:14] I think in the Beverage and Added Sugars subcommittee report, you were beginning to see some of that detail that the committees actually look at.

So, while we're focused on the summaries here, the evidence portfolios that are available to the committee are very detailed, and all of that information eventually becomes part of the public record as we keep moving through the process.

Whoops.

So, yesterday, we had the subcommittee reports from the Birth to 24 Months, Pregnancy and Lactation, Dietary Fats and Seafood, Beverages and Added Sugars, Data Analysis and Food Pattern Modeling, and I think a very useful committee discussion about, not

only each of those reports, but then how the committee is beginning to see the relationship between these different areas of work.

[0:11:15] And today, after these opening remarks, we'll be hearing from the subcommittee on Dietary Patterns and the Frequency of Eating subcommittee. And again, each of those will be followed by some committee discussion.

And we also then are looking forward to the public comments. And again, let me just note that the comments have been useful to the Departments, HHS and USDA, and useful to the committee in its work.

Many of you who have been following the process know that the website gives the status of our work, and that's a new part of the website to, not only just tell you about the Dietary Guidelines, but to track the work that the committee is actually doing.

[0:12:05] And plus, it provides a lot of information on the process, the ways that the committee is in fact evaluating the information.

The Departments do continue to update the information on that website, not only on sort of the protocols and where we are, but also, updating the Frequently Asked Question section.

So, that way, they can clarify the approach that the committee—for example, I know that there have been some updates to provide more information on our process for evaluating evidence, the data analysis, the systematic reviews, and the food pattern modeling, just to make sure that the way the committee is working through is clear to the public as we move forward.

[0:12:56] So, I encourage you to either be on the Listserv for the *Dietary Guidelines* as a way to get notices as updates happen, but also, just check back to that website, and particularly, look at that FAQ section if you have some particular questions in your own mind about the approaches that we're using, that you can find some more information.

So, a note on our timing today. Again, our afternoon session will begin at 1:00 pm Central time, and we really try to hold clear to that time because of the webcast.

[0:29:05] Our breaks during the morning and afternoon session are not set for a specific time but will be taken as they fit within our discussion.

And our public comments will begin no later than 2:00 pm Central time, but they may begin earlier if we're ready to start that process. So hopefully, if you're giving a public comment, you'll be here before 2:00, just in case.

[0:14:01] So, again, this is the website for the DietaryGuidelines.gov, and as Eve, Dr. Stoody did yesterday, we've highlighted the place where you can view the protocols, with that reminder that, for the protocols presented, it's most useful to us if we have any comments you might provide by February 7th.

But I would also note, given where we are in the process, where the March meeting is really the last decision-making meeting for the committee, the last public meeting where we'll be getting subcommittee reports, feel free to get comments to us, if you have comments about our conclusion statements or other aspects of what the committee is working on by that February 7th date to be most useful in our decision-making process. So…

[0:14:57] But as noted by Mr. Lipps and others, the comment period is open until the committee concludes its work.

So, with that, I think we will start with our agenda for the subcommittees. Just I want to check with the committee members to see. Do you have any questions or comments at this point?

Jamy, please.

Dr. Jamy Ard: Jamy Ard. So, just as a point of process, would it be okay for us to interrupt presentations with questions today? Is that okay for discussion? I don't know if it's more efficient to let people go through the entire presentation then do what we've done.

Dr. Barbara Schneeman: I think we—I'll let each subcommittee chair sort of address that at the beginning, if they're comfortable with having that approach. So, we have the two subcommittees, but we'll just let them say whether they're comfortable with that.

[0:16:02] ***Dr. Carol Boushey:*** It's a time issue.

Dr. Barbara Schneeman: Right. But it might be useful.

Dr. Carol Boushey: Because I don't mind.

Dr. Barbara Schneeman: Okay.

Dr. Carol Boushey: I mean—

Dr. Barbara Schneeman: Well, let me just check before we jump into—anybody else, question or comment?

Okay. Oh, okay, so both are fine with that. So... Okay, so, Carol.

Dr. Carol Boushey: Good. Let me—I'm going to move this over to here if that's alright.

[Sidebar conversation 0:32:06- 0:32:18]

Dr. Carol Boushey: Good morning, again, because I think you said good morning, too.

And so, my name is Carol Boushey, and you can see on this list the members of the Dietary Patterns subcommittee.

[0:17:03] And I think this is the largest committee in numbers, and maybe has to do with we do have a lot of work to review, because this area of dietary patterns has really exploded since the last Dietary Guidelines Advisory Committee.

So, the NESR staff, they've been screening articles preparing evidence portfolios, and in screening, we've screened approximately 113,000 articles from the electronic search results for questions dietary patterns and sarcopenia, all-cause mortality, and a combined search for the questions related to growth, size, and body composition, type 2 diabetes, and cardiovascular disease.

[0:18:04] In addition, the NESR staff has extracted data and assessed risk of bias for more than 190 articles and additional extraction is underway.

Today, the subcommittee will present the evidence and draft conclusion for the dietary patterns and all-cause mortality. The subcommittee is also refining and prioritizing its remaining work for the questions related to dietary patterns and sarcopenia, cancer, neurocognitive health, and bone health, which will be discussed in more detail at the end of this presentation.

I wonder if that is there. That might be a holdover of something else, but we'll see.

So, our key definitions, so you've seen this before, many people have seen this before, but the key definitions that we're using for dietary patterns are the quantities, proportions, variety, or combination of different foods, drinks, and nutrients, when available, in diets, and the frequency with which they are habitually consumed.

[0:19:12] This key definition came from—oh, apparently, we didn't put that in this time. Okay. All information provided by studies about diet. Because it came from an international statement, so this wasn't created just for this, and so, it is internationally recognized as the definition for dietary patterns.

All information provided by studies about dietary patterns tested or examined, including both foods and beverages, macro and micronutrients, will be extracted from included articles, and that macro and micronutrients, that was added as a result of comments from individuals outside of the Dietary Guidelines committee, the comments we received, we added in that component within the dietary patterns.

[0:20:13] Based on conversations at the last committee meeting, and misconceptions among the public and media, the SC refined the intervention/exposure criteria for the intervention/exposure to clarify how the subcommittee will consider dietary patterns as well as diets based on macronutrient distribution and how they may or may not related to each other.

For the first time, the subcommittee is considering diets based on macronutrient distribution, where at least one macronutrient that is either carbohydrate, fat, and/or

protein is outside the acceptable macronutrient distribution range or it's also known as AMDR, set by the National Academies of Science.

[0:21:03] For example, any study in which carbohydrate intake is above or below the AMDR, greater than 65 percent of energy or below 45 percent of energy, that also meets the inclusion/exclusion criteria provided in the protocol, will be examined to answer the questions.

This approach allows the committee to systematically review the overall scientific landscape of dietary patterns, including patterns that are both within and outside the AMDR, along with different diet types.

So, the question that will be reviewed today, we'll be presenting the findings from the systematic review question related to dietary patterns consumed and all-cause mortality. The approach to answer this question is a NESR systematic review.

[0:21:59] You've seen quite a few analytical frameworks, and the analytical framework provides a foundation for the systematic review and helps to inform the approach for this question.

The subcommittee defines all-cause mortality as the total number of deaths from all causes during a specific time period.

The exposure of interest is the consumption of and/or adherence to a dietary pattern.

The comparators are consumption of and/or adherence to a different dietary pattern and different levels of consumption and/or adherence to the dietary pattern.

The population of interest for the exposure and outcome include children through older adults who are healthy and/or at risk for chronic disease. For this question, the subcommittee decided that infants and toddlers from birth to 24 months were out of the scope.

[0:22:58] The key confounders are listed on this slide, and within the body of evidence the subcommittee reviewed, the majority of studies accounted for these factors.

Oh yeah, here we go.

This slide illustrates the literature search and screening results for articles examining the dietary patterns and all-cause mortality.

The results of the electronic database searches, after removal of duplicates, were screened independently by two NESR analysts using a step-wise process, by reviewing titles, abstracts, and full texts to determine which articles met the inclusion criteria.

For this review, 11,547 articles' titles were searched. 1,693 articles were abstract-screened. And 554 articles were screened at the full text level.

[0:23:59] A manual search was done to find articles that were not identified when searching the electronic databases. All manually-identified articles are also screened to determine whether they met the criteria for inclusion. For this review, no articles were identified during the manual search.

The review resulted in 152 included articles.

The 152 articles in this review are all prospective cohort study designs, and an aside there, we're kind of glad about that. We hope that no one ever does a randomized trial that the endpoint is death. So, in some ways, this is something to be very grateful for. They examined the relationship between dietary patterns and all-cause mortality.

The studies used multiple approaches to assess dietary patterns. 105 articles used only index or score analysis to examine the relationship between dietary patterns or diets based on macronutrient distribution and all-cause mortality.

[0:25:08] 18 articles examined the relationship between dietary patterns with factor and cluster analysis and/or diets based on macronutrient distribution.

27 articles examined the relationship between diets based on macronutrient distributions.

Of the remaining 15 articles, 6 articles used multiple methods, including both index analysis and factor analysis, or factor analysis and reduced rank regression, or just reduced rank regression was used for comparison.

Of the 27 articles that evaluated macronutrient distribution, 15 articles also used another approach to examine dietary patterns.

[0:25:59] So, a lot of stuff.

Despite the variety of different methods applied to examine or derive dietary patterns, there was remarkable consistency in the majority of the studies finding statistically significant relationships between dietary patterns consumed and all-cause mortality. Although the dietary patterns were characterized by different combinations of foods or beverages, due to the variety of methods used, protective dietary patterns emerged with the following themes.

Patterns emphasizing higher consumption of vegetables, legumes, fruits, nuts, whole grains, fish, lean meat, or poultry, and unsaturated fats relative to saturated fats, either as a ratio of MUFA to saturated fat, or a MUFA plus PUFA to saturated fat, or olive oil specifically, they were generally associated with decreased risk of all-cause mortality.

[0:27:05] Notably, there was consistency in particular with the inclusion of fish and/or seafood.

Of the dietary patterns that included animal products, protective associations were generally observed with relatively lower consumption of red and processed meat, or meat and meat products.

Some of the dietary patterns also included alcoholic beverages in moderation within specific thresholds.

The inclusion of white meat to red meat ratio, type and amount of dairy products, and refined carbohydrates, sweets as elements of these patterns was less consistent across the evidence.

Among the dietary patterns that included higher consumption of white meat relative to red or processed meat, low-fat dairy relative to high-fat dairy, and lower relative to higher refined carbohydrates and sweets tended to show reduced risk of all-cause mortality.

[0:28:09] Despite the variability between approaches used to examine dietary patterns, higher adherence to dietary patterns with common labels, such as Mediterranean, Dietary Guidelines-related, and also, Dietary Guidelines, such as Healthy Eating Index, DASH scores, or plant-based guides were generally protective against all-cause mortality risk.

This highlights that high-quality dietary patterns comprised of nutrient-dense foods, regardless of the label, were associated with decreased all-cause mortality risk.

[0:28:56] And we even, the next one, we'll have a little—where is that one? Oh, it's later.

Although all included studies were prospective cohort studies, the majority of articles reported adjustment for most key confounders, as I had mentioned earlier, with the exception to race/ethnicity. Due to lack of reporting, it is difficult to determine the impact that race/ethnicity specifically may have in the relationship between dietary patterns and all-cause mortality.

The largest segment of evidence in this systematic review used the index or score analysis to assess dietary patterns. Within this segment of evidence, nearly 80 different indices or scores were used to assess dietary patterns, including 30 Mediterranean indices. Now, to make that clear, it doesn't mean that the Mediterranean diet was used 30 times, it was 30 different variations of the Mediterranean diet, with the Mediterranean diet score by Trichopolou as being the most frequently used.

[0:30:13] There were 7 Healthy Eating Indexes that were used, or the *Dietary Guidelines for Americans* indexes.

Only 1 DASH score. So, DASH was the same across the board, no matter what study that used DASH.

16 country-specific indices, such as the Dutch Health Diet Index, and 24 other indices or scales, such as the Recommended Food Score.

Across all indices or scores, the following items or components are generally, but not exclusively, considered. So, this is an extensive list here that I'll give you a few minutes to look through or take an image.

[0:31:10] And it's important to know that these were not exclusive. So, we can't say that every dietary pattern had one of these in there. This is just a summary of the most common food sources that made up the components of the dietary patterns.

Macronutrient distributions with proportions of energy falling outside of the AMDR for at least one macronutrient were examined in this body of evidence, but results were not consistent. Notice we have switched to summary of evidence synthesis.

Among these studies, proportions of carbohydrate reported were both below and above the AMDR.

[0:32:00] Proportions of fat reported were both below and above the AMDR.

No studies examined macronutrient distributions in which protein fell outside of the AMDR.

Comparison of the macronutrient distributions with or without the context of the foods/food groups comprised in the dietary pattern showed inconsistent findings due to several limitations.

The gradient between the macronutrient proportions compared between distributions was small, a range of 41 percent to 41.7 percent.

Most methods used to estimate macronutrient intake differed between studies.

Most proportions reported were only marginally outside of the AMDR due to the variants with which studies defined and applied limits to macronutrient categories.

[0:33:03] When viewing these null results, the committee reflected, looking at macronutrient distribution without diet quality is maybe a moot activity. That was just a reflection of ours.

So, the strong evidence suggests that certain dietary patterns in adults and older adults are associated with decreased risk of all-cause mortality. These dietary patterns were characterized by intake of vegetables, legumes, fruits, nuts, whole grains, fish, lean meat or poultry, and unsaturated fats relative to saturated fats.

[0:33:56] Of the dietary patterns that included animal products, protective associations were generally observed with relatively lower consumption of red and processed meat or meat and meat products.

Some of these dietary patterns also included alcoholic beverages in moderation or within specific thresholds.

The inclusion of white meat/red meat ratio, type and amount of dairy products, and refined carbohydrates/sweets as elements of these patterns was less consistent across the evidence.

However, the dietary patterns that included higher consumption of white meat relative to red or processed meat, low-fat dairy relative to high-fat dairy, and lower relative to higher refined carbohydrates and sweets tended to show reduced risk of all-cause mortality.

Macronutrient distributions with proportions of energy falling outside of the AMDR were examined in this body of evidence but results were inconsistent.

[0:34:57] And there was—insufficient evidence was available to determine the relationship between dietary patterns and all-cause mortality in younger populations, and that's ages less than 35 years.

Coming next, and I should mention on that last slide, you have been used to seeing all of these different grades. The evidence on this was so clear.

Out of all the papers that we reviewed, outside of the macronutrient distribution, there were really only 10 papers that didn't have a significant results of protection with regard to dietary patterns, high-quality dietary patterns.

So now, where we're going is, we're refining and prioritizing remaining work. The subcommittee is in the process of refining and prioritizing its remaining work. This includes looking at the intermediate and endpoint outcomes and refining what the subcommittee will have time to accomplish.

[0:36:06] For example, the subcommittee has decided to only look at the endpoint outcome of sarcopenia and severe sarcopenia and excluding articles that only examine intermediate outcomes.

For the question related to cancer, neurocognitive health, and bone health, the subcommittee is reviewing the work of the 2015 Dietary Guidelines Advisory Committee and may refine outcomes to align with these existing reviews or carry forward existing work.

The other next steps are to complete the data extraction and risk of bias assessment of dietary patterns and sarcopenia. The NESR staff is also in the process of screening the scientific literature for questions related to dietary patterns and growth, size, and body composition, dietary patterns and type 2 diabetes, and dietary patterns and cardiovascular disease.

[0:37:09] We will also develop a conceptual framework to facilitate evidence synthesis based on dietary patterns and their components, which may include foods and beverages, food groups, and macronutrient distribution in the context of diet quality.

Thank you for listening to the summary of our work to date in the Dietary Patterns subcommittee. Here, we have listed, again, the members which were on the opening slide, but also, the support staff, because we wouldn't be able to do any of this work without the great support staff that we have from the USDA and the Department of Health and Human Services.

So, no one interrupted me, so why don't you do that now?

[0:37:59] [Applause]

Dr. Barbara Schneeman: Great. Thank you.

Dr. Carol Boushey: Rick?

Dr. Barbara Schneeman: We have Rick, then Rachel, and…

Dr. Carol Boushey: But let's go with Rick first, because he's usually first.

Dr. Richard Mattes: Rick Mattes. Thank you. So, Carol, you commented on the consistency of the findings, and noted that these are 100 percent prospective cohort studies that often have large sample sizes.

Can you comment on the effect size of the trials? They may all be significant, but to what degree are they meaningful?

We have big sample sizes; you can find small differences statistically significant. To what degree do you—does the evidence indicate the—

Dr. Carol Boushey: Well, you know, actually, not all of them were completely large, Rick. That's what's interesting. We should—does anyone have a kind of an outline of what the—some of the ranges of sample sizes were?

[0:39:04] And some of the ones that didn't find the significant results were smaller ones, but they were—there really were some as small as 200. Yeah.

Dr. Richard Mattes: Okay, nevertheless, can you comment on effect size, not just significance?

Dr. Carol Boushey: Yeah, I don't know that I can comment on it. I'd have to actually think about that a bit. But that's—does anyone else on the committee have an idea of what the effect size might be?

Joan?

Dr. Joan Sabate: Joan Sabate. The effect size did vary. I mean sometimes, is just a decrease in the risk of 10 percent, but sometimes went up to 25 percent decrease. So, this is the effect size on these dietary patterns that I do remember. Maybe there is a table that staff

can show on the screen, but I—the effect size was sometimes not very big, but that's quite considerable.

[0:40:02] ***Dr. Carol Boushey:*** That's good. Thank you.

Dr. Elizabeth Mayer-Davis: If I could just—Beth Mayer-Davis. So, I'm recalling hazard ratios that were around 0.85 to maybe 0.95, something like that. But it did vary. And some of that was a function of duration of follow-up, which is another issue that varied quite a bit across all of this literature. And sample size did vary quite a bit.

I've actually never seen a set of data with this degree of consistency. It was quite remarkable.

Dr. Carol Boushey: Yeah, I'm glad you guys remember those numbers.

Dr. Joan Sabate: Joan Sabate again. Not only the effect size, but also some of these indices. I mean there were different categories. So, there was a kind of a dose response effect that was quite visible in all this body of literature.

[0:40:54] ***Dr. Carol Boushey:*** Yeah, I really cannot emphasize enough this whole idea that there's no one magic bullet, but when you have consistent, high-quality diet, it can be achieved using multiple foods, and as long as it fits within these tight guidelines of what we outlined, low in certain fats, low in sugar, and all of our—low in—controlled sodium, it's quite remarkable.

Dr. Rachel Novotny: Yeah, thanks. That was really interesting. It makes me reflect on sort of the work of the whole committee, particularly those of us that are looking at foods, food groups, seafood, added sugar, beverage, and really broadly, our methods.

[0:41:58] And it seems clear that we're moving in this direction, and a lot of our methodologic challenges have to do with the reality of focusing on a food in the context of a very complex diet.

And therefore, it makes me—if we could start all over again, or start again, or have longer, the idea of basically pulling out those foods within a dietary pattern, or looking at the dietary pattern with an emphasis on those that are high in, say added sugar, or those that are high in certain beverages, or even overall beverages, those that are high in seafood, some way of basically looking at that list of foods in the scoring and defining diets according to our foods of interest.

[0:43:01] I think it's—so I guess the short real question is whether any of that is still possible to contribute to the other committees. I know that we're also trying to tie up our work. But if not, I think, as a committee, something to think about in our recommendations as to how to go forward with this kind of review of literature in the future.

Dr. Carol Boushey: You know? I actually really—I like that comment that you made, Rachel, but I also actually like that we have these other—that we're looking at it in different ways to give real affirmation. I really do like that.

But your comment about what the foods are, actually, Liz and Laural have been working on this, and they've created—right now, it's in an Excel spreadsheet, and we're trying to figure out—it's massive. So, we're trying to figure out how we can condense it down.

[0:43:59] The best that we got was that one slide that you saw with all the foods listed. That fit on the slide, so that worked well.

But it is, it's extensive. Do you want to shake your heads? Yeah.

And so, the neat thing is, is you've given them affirmation for the amount of work that it took them to do that.

And so, if you want to work with us as to how we're going to make it something that can be shared, that would be fantastic.

I think it's you hit it spot on.

Dr. Barbara Schneeman: So, Tim, I'm going to add you and I'm going to add myself. So, Heather is—

Dr. Heather Leidy: Heather Leidy. This is more just a clarification/methodology question. Because at the last meeting, you brought up a lot of analytical framework, but I think it's a little bit more teased out now.

And so, my question is related to whether—and I don't think this is the case, but I'm going to ask anyways—whether studies that were just varying in macronutrients.

[0:45:01] And so, some of the public comments and the discussions were about ketogenic diets, or low-carb diets.

And so, when you look at those studies from a manuscript perspective, a lot of them are prescribed from varying in macronutrients, not food first. And so, my question is, I would imagine that a lot of those studies were excluded based on the definition of the dietary patterns in your analytical framework. And so, just to clarify that, because it seems like a lot of the dietary patterns, the studies were selected, and then macronutrient composition was kind of described and compared in subsequent analyses.

And so, a lot of the studies, maybe not for all-cause mortality, but I think as we get into the other outcomes that would have randomized control trials, most of the studies, maybe not the most, but a good number of them would actually be macronutrient composition first, but because they are generally not always describing the foods in those diets, just to clarify, they would actually be excluded from these analyses. Is that correct?

[0:46:00] Because they're not foods, they're generally macronutrient-specific comparisons, and that's not in your analytical framework.

Dr. Carol Boushey: Do you want to speak to that?

Dr. Lydia Bazzano: I'll take that up, because we did specify that if there was—even if they didn't describe the foods, but if they had a macronutrient intake that was outside of the AMDR for any fat, carbohydrate, or protein, we included them even if they didn't have food description but they had a nutrition description of like what the components, for instance, what kinds of fats, what kinds of fiber, etcetera, if they had any kind of a description like that, they were included.

Dr. Heather Leidy: Okay. So then, just to clarify, in terms of the definition, or maybe I missed it, it seemed like the dietary pattern definition was really looking at foods.

Dr. Carol Boushey: Yes.

Dr. Heather Leidy: But that would be different than—

Dr. Carol Boushey: That's for dietary patterns. The macronutrient distribution is a completely different concept.

[0:47:03] ***Dr. Heather Leidy:*** Okay.

Dr. Carol Boushey: Yeah, it's in addition to, it's not—the dietary, when we look at the macronutrients, we're just looking at the macronutrients.

Dr. Heather Leidy: Okay, so it's basically a separate—it's a separate question from the dietary patterns then?

Dr. Carol Boushey: It is, it is.

Dr. Heather Leidy: Okay.

Dr. Carol Boushey: I mean it's—yeah, because they're not the same.

Dr. Lydia Bazzano: And then, the main issue here is that it's all-cause mortality. So, I mean that's our outcome for this one.

There will be randomized control trials in other outcomes.

Dr. Heather Leidy: I was just more looking forward, when the next analytical framework we see, with all the other outcomes. I though if it was the same, it's going to miss those diet comparisons just based on the definition of what you have in our analytical framework.

Dr. Carol Boushey: Right. And for the macronutrients, that's a whole—that was that different definition on that second page.

Dr. Barbara Schneeman: Actually, can I—I know we have a comment from staff, but keep in mind that, in the analytical framework, under the inclusion and exclusion criteria, if there's a particular diet, but it's really a treatment diet, and that's the whole point of the study, that would not necessarily get included as well.

[0:48:15] So, that's another factor to keep in mind.

Laural English: This is Laural English. So, just to clarify, I think the points, the comments that were just mentioned are accurate.

But we kept the analytic framework with just that more simplified version, really to speak to the overall package of the diet. And so, the intent was to cover the dietary pattern, as Dr. Boushey had shown in the definition, particularly if you notice in the definition, there's defined by the foods and drinks, as well as nutrients when available.

And so, it was the case where there was a paper or an included article that looked at the dietary pattern, but also reported enough information in macronutrient distribution and which one fell out of the AMDR.

[0:49:09] However, we also included articles that were just based on the macronutrient distribution, because in the criteria, it does specify that the foods or food groups do not need to be required for inclusion based on the diet—for the diets based on macronutrient distribution.

So, the framework is a little more simplified, but the inclusion/exclusion criteria gives a little more detail to speak to that.

Dr. Barbara Schneeman: So, Tim?

Dr. Timothy Naimi: Yeah, I was just wondering—Tim Naimi, Boston University. You may be getting to this later, but for the studies of all-cause mortality, I was interested in how does the distribution of cause of death break down? Where is the reduction in mortality? Is there any general comments you can provide on that?

Dr. Carol Boushey: I don't think we did that. That's an interesting question.

[0:50:01] We did not. It was just all-cause. We certainly would probably have it from many of the studies. So, perhaps that would be something of interest to enumerate that a bit. It does vary across the things, but good question.

Dr. Barbara Schneeman: It would be good to add that question.

Elsie?

Dr. Elsie Taveras: Elsie Taveras from Mass General Hospital.

Carol, I was wondering if—I know you said this is going to be covered in the next meeting, but could you talk a little bit about the decisions that you're weighing for reprioritizing the cancer, neurocognitive health, and bone health questions? Is there room or time to weigh in on maybe some of those decisions about using existing reviews or what some of those endpoint outcomes are?

Dr. Carol Boushey: We are going to use some. I don't have the list here, but here's, just to—remember when we had our first meeting and we were all so excited and stuff? So, we had—

[0:51:06] ***Dr. Barbara Schneeman:*** What are you implying? You're not excited anymore?

Dr. Carol Boushey: So, what happened—well, we thought we would get this done in a week, right? And so, when—if you remember, we had kind of an open forum, because there was a list of what cancers we were going to look at. And recall then, we said, "Well, let's add some more."

And so, we added in liver cancer, I believe, and then pancreatic cancer. Isn't that the—weren't those the two we added in?

And so, as we see how much work all this is, we're thinking of maybe recommending that the next group do liver and pancreatic cancer, and by that time, there's going to be really a lot of data for them to use.

And then, the other one, in fact, I should probably—I might—let me punt this over to you all, because you know which ones are going to be coming out, but they were all the ones we added when we had our wonderful first meeting, and we were just so thinking we'd get through this in a day.

[0:52:17] So, do you want to add what—because what were the others that came out?

Laural English: So, the other cancers specifically, or the other questions?

Dr. Carol Boushey: Or did I get them all with those two?

Laural English: I think so, yeah. There is childhood leukemia, liver, endometrial, and pancreatic as additional.

Dr. Carol Boushey: Oh yeah, those were all added. And then, what—there was another—we also eliminated some in the—I think the—we also, I thought we had eliminated some others.

Laural English: I think that those were the new cancers added.

[0:52:58] So, the existing review speaks to the other four, breast, lung, prostate, and colorectal cancer. So, I think those were the four that were—

Dr. Carol Boushey: Yeah. Did—hearing that list, did you have some that you think we should definitely try to address?

Dr. Elsie Taveras: Not for the cancer. I was wondering where you think you might carry forward existing reviews.

Dr. Carol Boushey: Oh, let me look at the notes here again as to which ones are—

You have them memorized better than me. Which ones will we carry forward with existing reviews?

Laural English: For the bone health question, there's an existing review, as well as the neuro. So, with bone health, it's pretty much just a very similar framework and set of outcomes that was in the existing review. For neuro, there are several additional outcomes. The existing review covered more of the realm of neuropsychological illness, so depression and Alzheimer's disease and cognitive impairment type outcomes.

[0:54:02] And so, those were covered in the existing review, so those could be carried forward.

The additional outcomes, I believe, were anxiety, ADHD and autism spectrum, and then more of the childhood outcomes with developmental domains, and those were not exclusively covered in the existing review.

Dr. Elsie Taveras: And will those then not be reviewed?

I'm particularly interested in the neurocognitive outcomes and if—

Dr. Carol Boushey: No, we'll update them.

Dr. Elsie Taveras: Those are going to be updated? Okay.

Dr. Carol Boushey: What we're doing is we're not going to go from scratch, like what we've just done. We'll update those.

Dr. Elsie Taveras: From in the last five years of reviews? Okay.

Dr. Carol Boushey: Right. Yeah, and I believe someone did that yesterday, they spoke to that.

Dr. Barbara Schneeman: Yeah, from the B24.

Dr. Carol Boushey: From the B24. Oh yeah, because they had all that work from done earlier.

[0:54:58] Yeah, so that isn't going to be lost.

Dr. Barbara Schneeman: Actually, I want to take a turn, too. So, I would be interested in the comments, and I know the subcommittee has been talking about this, that just sort of one of the dilemmas with looking at the macronutrients in isolation, where it's not considering diet quality, that do you wind up with some of the inconsistency that you really have to factor in diet quality once you start dealing with the macronutrients?

So, I'd be interested in some discussion around that.

Dr. Carol Boushey: Yeah, it's—do you want to, it's so much fun, do you want it? It is—

Dr. Barbara Schneeman: Well, and Jamy can come in.

Dr. Elizabeth Mayer-Davis: I was going to refer to Jamy, because we—our committee has given this a great deal of thought. It also relates to Rachel, Dr. Novotny's comment about integration really across subcommittees.

[0:56:01] But Jamy really initiated some of this conversation, so let me have you comment on hierarchy.

Dr. Jamy Ard: Okay. Jamy Ard. So, I think the way we've really sort of looked at the scope of data for all-cause mortality really starts at a few different levels.

And I think it does lead to a fairly consistent narrative and the conclusion that you saw, that the dietary pattern is really driving the overall effect, and the dietary pattern, the consistent narrative and the conclusion that you saw, that the dietary pattern is really driving the overall effect, and the dietary pattern, the consistency of that effect, or the strength of that effect, the effect size, is likely related to the food group consumption and the adherence to the dietary pattern.

So, you can have a DASH dietary pattern that you say you're following, but there's levels of adherence.

[0:57:04] And if you are closer to an ideal, as studied in the original DASH trials, dietary pattern, then you see the strongest effect. If you start to dilute that in terms of changes in the food groups and quality of the foods that are part of that pattern. So, you may still be technically consuming fruits and vegetables and whole grains and low-fat dairy and so forth, but if the quality of that starts to decrease, you see a decrease effect.

So, there are trends, and we didn't report on that, but there are fairly consistent trends even within a dietary pattern. As you go from higher adherence to lower adherence, you see decreasing effect sizes in terms of protectiveness.

And then, so you also then look at it from the macronutrient standpoint. And so, that's how we got to this idea of "Well, let's look at the macronutrients outside of the AMDR,"

because there's a lot of public interest in this idea of "Well, if I am eating fewer carbohydrates," or "If I'm eating higher fat content," is that beneficial? Is that not beneficial?

[0:58:14] And so, this literature gave us an opportunity to say, "What can we see in that regards?"

And the fairly consistent thing, even though the overall data are inconsistent, the fairly consistent thing was that, within the context of a given dietary pattern, you saw there's really not much effect of the independent macronutrient distribution, right? It always rolls up to the dietary pattern that you are considering.

And so, once you start to think about, "Okay, well, we've looked at it from the overall dietary pattern. We see a fairly consistent response across all of this literature," we've got, even within that literature, some different food group analyses.

[0:59:09] So, not everything was dietary patterns. Some of those were diet patterns that were higher in fats, or sugar-sweetened beverages, or different clusters of food groups that people looked at as a—and named as a dietary pattern.

And you saw, again, fairly consistent results. The higher-quality foods tended to lead to more consistent protective effects. And then, we also looked at it from a macronutrient standpoint. And in every instance, you had to come back to the conclusion that the effects are being driven by the dietary pattern, so that creates this sense of a hierarchy, where we could say, at the top level, in the context of energy overall, energy intake overall, you have dietary pattern.

[1:00:00] And so, how you consume your calories in the combinations of foods that you put together overall, that is what matters most. Then, within that, it's the quality of the foods that make up the dietary pattern. And then, finally, it's the macronutrients that are contributing from the foods that you're consuming. And those do have some—I'm not saying that those don't have some biologic effects, they do.

But from a perspective of all-cause mortality, it seems to all be driven by this idea of a dietary pattern. And quality is the thing that sort of links all of these together, right? So, high-quality intake at the pattern level, high-quality food choices at the food group level, and even the quality of the macronutrients, high-quality fat intake, for example, or quality protein in where those protein sources are coming from.

[1:01:01] Those things do matter in terms of the sort of underlying consistency across that hierarchy. And so, I think in that way, it does provide a fairly unifying theme/narrative to say maybe, at some level, we've been too fascinated with macronutrients, and that's not gotten us anywhere, really.

And we should continue the narrative that the other committees have started, where we're starting to make this pivot to "Okay, well, let's actually really try to get people to look over here and think in terms of their overall pattern of consumption." And that may be more

beneficial, it seems to be more powerful, and certainly, seems to be more consistent, the evidence is very, very clear.

[1:02:00] I mean the magnitude, as Carol said, the magnitude of consistency across hundreds of studies, across hundreds of countries, in different populations and subgroups, men and women, that is fairly clear.

So, I think that's one way to potentially conceptualize this, and Carol alluded to the idea of, if we can come up with something that helps us visually encapsulate that.

Dr. Carol Boushey: We should really share that we have the volunteer for that, Dr. Heymsfield has volunteered to make our visual on that, and that is one of our big tasks. But we have Dr. Sabate? And then who's over here? Yeah.

Dr. Joan Sabate: Just emphasizing on this, and probably saying in a slightly different way, I mean for a long time, we have focused on macronutrients, and especially the amount of macronutrients, and the amount of macronutrients translates in the proportion as far as percentage of proteins versus fat, versus carbohydrates.

[1:03:04] But as we look at this, I mean we realize that it's the type of macronutrients, whether it's the type of fat, and particularly, the source that comes from foods.

So, although the macronutrients may be having the same name, I mean all come originally from foods. And so, is the type of macronutrients and the sources of macronutrients that may be influenced.

But when we take this outside the context of the food patterns and the foods, then in our analysis, we couldn't find much consistency on the results. But when we put into the context of dietary patterns and foods, that is the type and the source, then it starts making sense.

Dr. Carol Boushey: Lydia?

Dr. Lydia Bazzano: Okay, I would also just like to make the point, the same point that Joan here has made, but I mean if you think about a plate that has salmon and non-starchy vegetables on it that is—with olive oil, that's Mediterranean, that's also low-carbohydrate, or —so it's not the dietary—it's the dietary pattern overall, and the foods that it comes from, much more so than the specific differences in macronutrients.

[1:04:30] And I will say that we didn't have a lot of macronutrient differences. None of these were low-carbohydrate diets. They were all just barely below the AMDR or barely above, depending on which macronutrient was. So, I don't think we can take this and look at it specifically for those purposes, because it wasn't—this information wasn't meant to be looked at for those purposes specifically.

[1:04:58] I mean the studies weren't designed to compare those things.

Dr. Carol Boushey: Someone over here?

Dr. Barbara Schneeman: We just have Rachel and Rick.

Dr. Rachel Novotny: Just kind of a comment. I was thinking about the lack of evidence from childhood for all-cause mortality. I assume it's lack of data. Of course, it's a long study, and you hope children aren't dying early and so on, but, but that would be an interesting set of data to have.

I'm also thinking about having excluded the B24, and where there might be data, and thinking of EMRs and potentially, at least infant feeding data and data that might be available, if nothing else, for future recommendations.

Dr. Carol Boushey: And it might come up in our other questions.

Dr. Rachel Novotny: Yeah. And then, totally different. You know this is a topic of mine, but this starchy vegetable thing.

[1:05:59] I think here in the US, we usually think about potatoes, and I'm sure many people can find value in potatoes, certainly in the region I worked, there's a variety of nutrient-rich starchy vegetables.

So just, it is a problem in our analyses that I think we need to create a category for and actually look at the role of starchy vegetables, because they also are not high-calorie, and if—depending on how they're cooked.

So, I just think we—they deserve more attention in our patterns.

Dr. Richard Mattes: So, I want to follow, I think Jamy's description of the data is very, very important. We've, I think, mostly recognized that even small changes in body weight have disproportionate health benefits, and the dose response kind of findings that you have here raise the same question.

[1:07:00] If the population even makes small changes in the direction of these dietary patterns, can we expect disproportionately large health benefits to the degree that you can quantify sort of the magnitude of change necessary to realize benefit? I think that would be a very powerful message.

Dr. Carol Boushey: Well Rick, this will be interesting, because as we've all said, we'll hopefully get some randomized trials in the next topics that aren't all-cause mortality.

And I think that that's going to be one of the type of diets that we'll be looking at. We'll be looking at dietary patterns. And so, that will really help with answering that. It's a good point.

Dr. Barbara Schneeman: I also wanted to come back on, I think it was in the pregnancy and lactation subcommittee report yesterday.

[1:07:59] You had some discussion of food patterns. And as I recall, it sort of resonates very well with what we're hearing from the dietary patterns group, and it would be interesting to hear some comments.

Dr. Sharon Donovan: Yeah, for that, we were depending on existing systematic review. And so, Jamie was on that tech, so maybe would you like to address that?

Dr. Jamie Stang: Sure. So, when—Jamie Stang. So, when we did the Pregnancy Collaborative before this committee met, to do those reviews, and they're published, one of the things that we came down to is looking at dietary patterns, again, echoing that it came down to specific foods, because we had the new Nordic diet, and the DASH diet, and five kinds of Mediterranean diets.

But when you looked at them all, there were some very consistent components in each of the diets that had a positive effect you could pull out with a very good degree of consistency across the studies that it was fruits, it was vegetables, it was nuts and seeds, it was—

[1:09:09] And so, that's why we felt very strongly in our conclusion statement, that rather than naming the diets or talking about the healthy diet, that we put in those food components, because that's how people eat, right? They select fish and nuts and seeds. They don't select a Mediterranean diet when they're in their kitchens, or in the grocery store. So…

It seemed to be so consistent and so blatant that it just felt like it needed to be specified in those conclusion statements.

Dr. Barbara Schneeman: That also resonates well with what we—

Dr. Jamie Stang: Exactly. And I think, again, that's the—that is what we want to be able to tell people is, "You can call it what you want, but it is—these are the things that make up those diets that seem to have the health benefits."

[1:10:03] ***Dr. Barbara Schneeman:*** Do we have—Beth, were you? No. Other comments or discussions? Oh, Jamy, please.

Dr. Jamy Ard: I think—Jamy Ard. So, I think one other thing that this points to is the idea that certain things are bad, or not bad, or good, or so forth.

I mean that's something that we've got to sort of grapple with, right? So, I mean as I think about like Lydia's comment around a plate with lean protein or fish and vegetables being characterized as low-carbohydrate in that particular meal and instance, and being also consistent with a Mediterranean style of eating, I think one of the things that's confusing for people though is, well, a lot of these dietary patterns include active—actually include and give you more points for consuming higher amounts of vegetables, or I mean fruit, or whole grains, those types of things.

[1:11:21] So, I think we've got to, we've got to be careful in terms of helping people understand the nutritional value of these foods and not get confused by the idea of, "Well, if it has any carbohydrate, it's bad," right?

I think that's where—that's where we need to sort of come up with a way to help people understand this idea of quality of intake. Because again, even within any of the patterns, when the quality was poor, when the quality was poor, the effect was either null or reduced. And that was definitely consistent.

[1:12:06] So, all carbohydrates are not equal, all protein is not equal, all fat is not equal, all foods are not equal, all dietary patterns are not equal, right? And so, we've got to help people understand the nutritional value of foods and how we put those together to get the maximum impact.

Based on what the evidence we have, I think. I think if we don't, if we don't say something to that, then we're going to miss an opportunity to really help people do the things that we're talking about in terms of nutrients of public health concern yesterday, where if we say, "Well, we want people to be able to eat diets that are overall healthier," but we're afraid of eating a piece of fruit, then that's a problem. I think that's a problem.

[1:13:05] ***Dr. Barbara Schneeman:*** So, yes, Lydia?

Dr. Lydia Bazzano: I just want to second what Jamy said in that it's the lack of nuance that I think gets us into trouble, because it is, in fact, the foods that are high-quality that we need to be focusing on.

Dr. Barbara Schneeman: Other? So, I'm going to suggest we take a break right now, and then we can come back at 10:30 to hear the next subcommittee report. Is that agreeable to everyone? Okay. So, we'll be back here at 10:30 then.

[Break 1:13:47-1:33:10]

Dr. Barbara Schneeman: Okay, if we could reconvene, please.

Yeah, so we have one more subcommittee report to go through before the—before we take the break at lunch.

And I will just note that whatever time we're done, we will have to take a break, because they do need to set up the room to facilitate the public comments. So, do you want to—

Dr. Ronald Kleinman: Do you want me to introduce—

Dr. Barbara Schneeman: Yeah.

Dr. Ronald Kleinman: Alright. So, our next speaker is Dr. Steve Heymsfield, and he's going to present the summary findings of the committee that looked at Frequency of Eating. Steve?

[1:34:06] ***Dr. Steven Heymsfield:*** Thank you, Ron. First, let me begin by thanking my committee members, Carol, Heather, and Rick, who have really contributed a lot to this report. And also, we have finished our review. We're complete. And so, this is going to be a rather long presentation, but that's it. We're done.

Yeah. No, I know that. We do have that. Anyway, this is a new topic for the *Dietary Guidelines*, Frequency of Eating, and I thought I might begin just by a very brief summary of this topic, because it's also new to me.

[1:34:57] And if we think about eating behavior, which is the major topic of the *Dietary Guidelines*, there are three parts to it, to eating behavior. One is the quantity of food people eat. The second is the quality of food they eat, and that's the major deliberations that we've heard so far, and that's been the topic of the *Dietary Guidelines* for quite some time.

But there's a third part to it, and that's the frequency and timing of eating, frequency and timing of eating, and that, together with the other two, quality and quantity, determine eating behavior.

And the frequency of eating is a very understudied part of this area, but there's major physiology, increasingly understood physiology that relate to the frequency of eating, the number of times you have an ingestive event per day, even including water. So, it's a very important and interesting topic, and this is a new question for the *Dietary Guidelines*.

[1:35:58] And because of that, we've had very intensive discussions about what we mean by frequency of eating.

So, just a little brief background. Normally, "We eat three meals a day." That's kind of a fantasy, but "We eat three meals a day." And we can divide those into breakfast, lunch, and dinner. And that actually sums up very clearly. Number three is the frequency of eating, but also, breakfast, lunch, and dinner is the timing of eating.

So, the frequency and the timing are related to each other, and as you'll see as we move forward with our deliberations, we uncouple timing from frequency, and I'll explain that a little more later.

And the other thing we've struggled with is what is frequency of eating? How do you define it? And it boils down to what's called an ingestive event, or an eating occasion, and we've spent a lot of time thinking about what we mean by eating occasions, and that comes up to the search strategies we did as well, what we include as an eating occasion.

[1:37:06] And the tools for measuring eating occasion, there are really two main tools, there might be others, but the three-day diet diary is one, and the other is a food frequency. And as we plowed into those, we discovered there issues related to how you measure

frequency of eating. And lastly, there are two types of studies, observational and interventional, and each one of those, we've been able to separate out and have different criteria for.

Well, the search strategy then on frequency of eating, 41,000 articles have been screened, and there were 6 initial questions for this committee, and we've answered one of them in the previous meeting, in meeting 3, the relationship between frequency of eating and mortality, and we'll look at the remaining five today, and I'll briefly review, again, the mortality question.

[1:38:10] Now, the original question was "What is the relationship between frequency of eating, such as meals per day, snacking, fasting, and so on, and each stage of life, various life outcomes?"

And as I mentioned, the timing of eating occasions is important topic, increasingly important. We really focused our work, particularly as we moved on, on the number of eating occasions. We uncoupled those two because it turned out to be very difficult to find studies that had both the number of eating occasions and the timing of those occasions.

[1:38:54] The analytical framework and inclusion/exclusion criteria were updated at meeting 3 after our discussions here, again, focusing on the number of eating occasions and not the timing of eating occasions, and also, at meeting 3, we clarified the minimum size of study groups and power analyses criteria required for intervention studies, and we also noted that the requirement for data collection on two separate occasions was removed for observational studies but remained for intervention studies.

And this issue comes up a lot about observational studies. You quantify the frequency of eating at the beginning of an observational study, and 20 years later, you're looking at their outcome, but you don't have the second time point. So, many of the observational studies have only a single time point for quantifying frequency of eating.

[1:39:57] And we also noted that three 24-hour periods was retained as an attempt to capture customary frequency of eating. In other words, weekdays, weekends. If you have just a single 24-hour period, you don't really get a good sampling of what people are doing.

Now, the key definition then for frequency of eating is defined as in ingestive event, as I mentioned, an eating occasion, and that includes preload, meals, or snacks, and also beverages, energy or non-energy yielding beverages or food.

That's our key definition.

And for our inclusion and exclusion criteria, of course, the number of daily eating occasions, and the exclusion criteria are studies that only examine frequency of intake of a single food, beverage, or category of food or beverage.

[1:40:58] And as I mentioned, there are two types of studies. We looked at observational and interventional studies, and observational studies, we used data collection for eating

frequency that encompasses a minimum of three 24-hour periods, and that could be with three 24-hour dietary recalls reporting an ingestive event, or one eating frequency questionnaire documenting eating frequency for the past month.

Those were our criteria.

And the intervention studies are a little different. Of course, those are typically going to have two time points, the beginning and the end of the study, and for these studies then, we would have each eating occasion then encompasses a minimum of three 24-hour periods or a questionnaire that covers at least three days of—three days addressing eating frequency.

[1:41:58] For example, again, they'll have the 24-hour recalls, or the eating frequency.

And we also, for intervention studies, we want to make sure they were powered adequately. So, we decided that 15 participants were required for studies using within-subject analyses or 30 participants for studies for studies using between-subject analyses, or a power calculation is needed.

And the numbers 15 and 30, we did some back-of-the-envelope calculations to try and figure out the minimum number of people needed for a reasonable study that would give statistical significance.

So, the first question we were asked of the six was the relationship between frequency of eating and all-cause mortality. This was presented at meeting 3.

This is the analytical framework. The endpoint then is all-cause mortality as it relates to frequency of eating.

[1:42:58] This one was easy. There were no studies that we could find. So, no evidence is available to determine the relationship between the frequency of eating and all-cause mortality, and therefore, there's no grade assignable.

Now, the remaining five questions then is what we'll review today, gestational weight gain and pregnancy, postpartum weight loss, growth, size, body composition and risk of overweight and obesity, cardiovascular disease, and type 2 diabetes.

We screened, I'm going to have a hard time reading it, over 51,000 papers, and at the end of the day, that came down to 10 after rigorous screening of those. And on the bottom, you'll see they're divided up into the topics. The most studies were for growth, size, body composition.

[1:43:59] There were 6 papers for that. Cardiovascular disease and diabetes had 2. Postpartum weight loss had 1, and there were none for gestational weight gain.

So, the first topic then is relationship between frequency of eating during pregnancy and gestational weight gain.

The endpoint here is weight gain across a period of pregnancy.

And this is the analytical framework. Eating frequency was the intervention or exposure.

There were no studies that we came up between January 2000 and September 2019, so like mortality, there's no evidence available to draw a conclusion about the relationship between frequency of eating during pregnancy and gestational weight gain.

[1:45:04] The next question is "What is the relationship between frequency of eating during lactation and postpartum weight loss?"

The endpoint here is change in weight from baseline to a later time point during the postpartum period.

And here, we did find 1 study. It took place in Sweden.

Four-day weighed food records were used at baseline and follow-up to measure eating occasions per day. Change in frequency, of eating frequency between baseline and follow-up was assessed. The study outcome was reported as change in postpartum weight loss. And all of the women in the study were overweight or obese. 95 percent were exclusively breastfeeding, 5 percent were partially breastfeeding, and parity was 1.

[1:45:59] In this 1 prospective cohort study, they did not find a significant association between the eating frequency and a change in postpartum weight loss after a 12-week follow-up period.

So, we conclude then that there's insufficient evidence available to determine the relationship between the frequency of eating during lactation and postpartum weight loss.

The next question is "What is the relationship between the frequency of eating and growth, size, body composition, and risk of overweight and obesity?"

And the most papers we had available that met our criteria were in this category. There were 6 papers available. And it covered a broad spectrum of endpoints. For example, body mass index, weight, weight for age, and other endpoints like healthy weight, overweight, obesity, and so on.

[1:47:01] So, there's quite a few endpoints available for this study.

There were 6 that I mentioned. 1 was a randomized control trial. 5 were prospective cohort studies. 5 took place in the US. There was 1 study that was reported from Greece.

And the number of eating occasions in the comparison groups differed across the studies.

For example, some studies looked at 2 versus 3 meals, others looked at 1 versus 10, and so on. So, the number of eating occasions differed across the studies.

3 of the studies used 3-day food record, and 3 studies used a food frequency questionnaire with an added question to assess the number of daily eating occasions, because as I understand it, the FFQ normally does not have a question about eating occasions, and the studies that we included that had food frequency questionnaire as the tool also had an added question about daily eating occasions.

[1:48:09] And many study outcomes were reported, BMI, change in BMI, body fat, change in waist circumference, and so on.

There were 5 studies in adults. 3 of them reported a positive association between frequency of eating and growth, size, and body composition.

2 studies did not find a significant association between frequency of eating and growth, size, and body composition. And if you're like me, you're probably thinking "What does a positive association mean?" Well, okay, so a positive association means that more meals translate to bigger body size and composition. So, that's what that means.

A negative association would be more meals is less size and body composition, and so on.

[1:49:01] And we use the words interchangeably, inverse, negative, and so on here. We try to be consistent.

So, and 1 study in children reported an inverse association between frequency of eating and growth, size, and body composition after a 10-year follow-up study.

So, these are mixed kind of reviews on this topic. And so, these studies were inconsistent in how they defined and examined frequency of eating, the outcomes they examine in the reports and the reported results.

And they had several additional critical limitations, which you'll see again in some of the other questions. There was a high risk of bias, and also, high or unknown attrition rate in these studies trying to track how many subjects were entered in the beginning of the study, how many were at the end, and the reasons that they were taken out over time.

[1:49:58] So, the conclusion statement here for the largest of our samples, 6 in this question, was that there's insufficient evidence available to determine the relationship between the frequency of eating and growth, size, body composition, and the risk of overweight and obesity.

The next question is "What is the relationship between the frequency of eating and cardiovascular disease?"

And in this analytical framework, the endpoint is cardiovascular disease of all types, stroke, venous thrombosis, and so on. We also included intermediate outcomes here, lipid levels, blood pressure, and so on. Those were intermediate outcomes.

And we found 2 studies in adults that met the inclusion criteria. Both studies were prospective cohort studies. 1 took place in the US and 1 in Greece.
[1:50:59] The number of eating occasions, again, differed across the comparison groups. 1 study used a 3-day food record, and 1 study used a food frequency questionnaire with, again, the added question to assess number of daily eating occasions at baseline.

And the study outcomes that were reported were coronary heart disease, hypertension, systolic blood pressure, and diastolic blood pressure.

Now, 1 study reported an inverse association in adults between eating frequency at baseline and systolic and diastolic blood pressure and risk of hypertension after 5 years follow-up. This is an intermediate outcome, of course.

And 1 study reported no association in adults between eating frequency at baseline and coronary heart disease after a 6-year follow-up.

And obviously, the net result of that was kind of ambiguous outcome.

[1:52:00] The studies were inconsistent in how they defined and examined frequency of eating, the outcomes they examined and in the results that they reported. And again, the same types of limitations. There was a high risk of bias. The attrition rates were unknown in these studies.

So, we concluded then that there's insufficient evidence available to determine the relationship between the frequency of eating and cardiovascular disease.

The next question is "What is the relationship between frequency of eating and type 2 diabetes?" Very important question.

And the outcome—endpoint outcome here was type 2 diabetes.

And we had 2 studies here to review that met the inclusion criteria. Both were prospective cohort studies. Both took place in the US.

Both used a food frequency questionnaire with an added question to assess the number of daily eating occasions.

[1:53:03] And the outcome was risk of developing type 2 diabetes.

1 study reported in men. In this study, they found that men who reported 1-2 eating occasions per day had a higher risk of developing type 2 diabetes compared to men who reported 3 eating occasions a day. Not a very big gradient in the number of eating occasions per day, but they did find that.

But when they did a trend analysis, they didn't find any trend overall between number of eating occasions. They picked out that 1 significant finding of 1-2 versus 3 eating occasions per day.

And the second study was actually in women, and they did not find an association between eating frequency and risk of developing type 2 diabetes.

[1:53:57] Again, you see the same limitations here. The studies were inconsistent in how they define and examine frequency of eating and in their results. They also, again, had a high risk of bias. Weak study designs were present to answer this question. And the attrition rates were unknown.

Therefore, we concluded that there's insufficient evidence available to determine the relationship between frequency of eating during lactation—lactation? And type 2 diabetes? Okay.

Female: [indiscernible 1:54:36] copy and paste though.

Dr. Steven Heymsfield: I did not do that, and I proofread these too. Okay, well, you get the picture. Alright.

So, you can see that there are a number of limitations across these studies. One is the inconsistent and insufficient findings to draw conclusions about the relationship between frequency of eating and health outcomes, and that by no means doesn't mean this isn't an important question.

[1:55:08] It means that they studies that have been done to date really are inadequate to meet what we considered a very high bar for examining frequency of eating, ingestive events, eating occasions, and so on.

And for example, things like water ingestion, or water consumption's very rarely mentioned in these studies, something that should be done in the future.

There are very inconsistent measures of frequency of eating. For example, some studies included snacks. Others didn't. Some defined the inter-meal intervals differently, and so on. So, they're very inconsistent.

Eating frequency was only assessed at baseline in prospective cohort studies. The comparisons, again, the number of eating events were inconsistent across studies.

[1:55:59] Both energy-yielding and non-energy-yielding beverages were inconsistently accounted for, as I mentioned. And the attrition rates were very commonly unknown or undefined in the studies. And the study populations did not represent the race, ethnic, or socioeconomic diversity of the US population.

And research recommendations, there will be many coming out of it, and we thought a lot about what things we can do to contribute to future research. But of course, there's a need for more control trials. There's a need to develop a consistent definition of an ingestive event that includes eating and drinking and methods to quantify them.

We need to encourage documentation of frequency of water consumption. There needs to be a number of ingestive events across 24 hours, at least 3 days of ingestive event data on at least 2 discrete occasions to allow assessment of estimate reliability.

[1:57:12] It's very rarely done.

Report information on food insecurity to allow isolation of voluntary versus involuntary ingestive events, important consideration. And finally, need to report key confounders and other factors need important consideration.

So, the next step then will be systematic reviews will be peer-reviewed.

We'll collaborate with the Data Analysis and Food Pattern Modeling Working Group for the data analysis question answering, "What is the relationship between the frequency of eating and achieving nutrient and food group recommendations?" My understanding, from Robin's (Regan) presentation yesterday is that we're going to dig even deeper into that, right? There's more information about frequency of eating that we'll generate.

[1:58:03] It might be one of the most interesting parts of our report.

We'll use the frequency—use the findings of the completed systematic reviews and data analyses to draft the scientific report of the Dietary Guidelines committee.

And finally, I want to thank everybody on my committee, once again, and the NESR staff. Thanks very much.

[Applause]

Dr. Ronald Kleinman: Thanks, Steve. Questions? We'll start with Regan.

Dr. Steven Heymsfield: Robin? Yeah, sure.

Dr. Regan Bailey: In a weird turn of events, I have a question for Rick. What—is there research looking at the reliability and validity of self-reported number of eating occasions and what you would call an ingestive event?

Dr. Richard Mattes: Yeah, that's—we had substantial discussions about that.

[1:58:58] No, that's one of the issues. Frequency of eating just has not been in the foremost of people's thinking about eating patterns and so on.

And so, there's a pausity of data, as you've seen, and very little effort has gone into how to measure it. So, no, we don't have good evidence on that.

Dr. Regan Bailey: But I think that might be changing for the next committee's work with intermittent fasting, and things like that's more research is going on in that area.

Dr. Richard Mattes: Right. And that was frustrating for us. Heather pointed that out to us many, many times. There's a fair literature on intermittent fasting and breakfast-skipping and so on. And you would think that we should have incorporated that into our analysis.

The problem is those studies don't report the total number of eating events in a day, which we decided was the unit of time that we would focus on. So, you don't know what compensation there may be.

[1:59:59] Yeah, they skip breakfast, but maybe they had 3 more snacks in the evening to offset that. Without the totality of the evidence in a relevant period of time, you just can't draw conclusions.

Dr. Regan Bailey: Thank you.

Dr. Ronald Kleinman: Rachel?

Dr. Rachel Novotny: I wondered whether, in the—I know this wasn't directly your question, but whether in the body of evidence you looked at, whether there was a relationship between the frequency of eating and energy intake?

Dr. Steven Heymsfield: We didn't. Did we, Rick? I'm trying to think. We didn't. But that should be something available.

Dr. Heather Leidy: Yeah, this is Heather. It was more just because it was out of scope of our question. Intake would be an intermediate, or a mediator of sorts.

And so, just another comment, to Rick's point, too, a lot of these studies with skipping meals, whether it's breakfast or even snacking throughout the day, or intermittent fasting, they do publish energy intake and macronutrient content, and food choices and food selection, more energy content, but they just don't do the eating occasions.

[2:01:03] And so, our—we were trying to be true to the questions that we were being asked. And so, it was looking at eating frequency. We looked at our end outcomes, and they didn't include energy intake. We did use that as a covariant?

Dr. Steven Heymsfield: Yeah.

Dr. Heather Leidy: In the model, but not—we didn't specifically use that as an endpoint because that was not one of the—that wasn't part of our questions. But it's a really, really good point, and we do have intake data on that.

It was just the fact that the majority of studies that we thought would be included were just not because they didn't report eating frequency. It was—they generally had a concept, a topic around eating frequency, but there—it was just looking at energy or macronutrient composition.

Dr. Richard Mattes: Can I just follow up on that? So, not based on the papers that we reviewed, but just sort of the familiarity with the literature in this area, it's one of the more interesting and frustrating issues, because there is a sense that increased eating frequency is associated with increased energy intake.

[2:02:05] NHANES data shows it, and so on. But the translation of that to body weight is not consistent at all. And so, resolving that, that inconsistency, is a very important question, and we just don't have the data to do it.

Dr. Rachel Novotny: Okay.

Dr. Ronald Kleinman: One study in childhood actually showed an inverse relationship, which was a little bit hard to figure out.

Dr. Heather Leidy: And just another point, too. And Steve had said this. We linked—initially, we linked timing and frequency, because they are obviously related, but then to answer our question, we removed the timing and focused on frequency. There probably is more research, we didn't review it, on timing, but in order to assess timing, you really need to also look at 24-hour frequency. So, they go hand in hand.

And so, I think it's—our research recommendations will be highlighting that point that timing, I think, is important. It gets to some of these other questions. But our charge was really looking at eating frequency.

Dr. Ronald Kleinman: Kay?

Dr. Kathryn Dewey: Yeah, thanks very much. I have three questions.

So, one of them, I know that you had these criteria for the number of times that dietary intake frequency was assessed, and there was—that was also for the randomized control trials. So, my question is, were there any randomized control trials excluded because they didn't have enough dietary assessment days according to your criteria?

I brought this up at the last meeting, because I was a bit concerned, because a randomized trial, when you're assessing that aspect, it's really a measure of adherence. And so, it's a little different than for the observational studies.

So, I'd just like to know if any were excluded for that reason?

And then, there was one randomized trial for the growth, size, and body composition outcomes, and I'd like to know a little bit more about that one, the size, the target group, and what they found, just because that's a stronger design than others.

[2:03:56] And lastly, there was a slide for the diabetes outcome where I think you said there was no dose response, but the bullet said that there was. So, I was a bit confused. Maybe it was a typo.

Dr. Steven Heymsfield: I think, starting with the last one's probably the easiest one. I think what they did is they had—they used an analysis of variants and found no trend across the studies, but when they went in and compared individual comparisons, like 2 versus 3 meals a day, they got statistical significance.

Isn't that it, more or less, Rick?

Dr. Richard Mattes: Yeah.

Dr. Steven Heymsfield: That's what they did.

Dr. Kathryn Dewey: Well, the second bullet in the slide says, in the same study, there was also a significant dose response with increased eating occasions and risk of type 2 diabetes.

Dr. Richard Mattes: Oh, that might be an error.

Dr. Steven Heymsfield: I think that was not—again, I don't think that's right from what I recall reading.

Dr. Richard Mattes: Yeah, I think there was a significant P for trend, but the—a not significant P for trend, but in a separate—it wasn't like in an over, and then they went back and did a post hack to see where a difference may have occurred.

[2:05:11] In a separate analysis, they just happened to notice that the distinction between eating once or twice versus three times was significant.

And I don't want to accuse them of P hacking or whatever, but there are many, many pairwise comparisons one could do in that data set, and just happened to be one that isn't necessarily the most logical one that one would have a priori examined.

Dr. Heather Leidy: And Steve, I can answer the questions, the ones as far as the randomized control trials and whether they were excluded based on 2 separate occasions. And I can defer back to the NESR folks. But I'm pretty sure that that wasn't the case that, when they were—the studies that were excluded were primarily the—I don't want to say primary.

[2:05:58] Some of them were because of the lack of 3-day assessments and not the pre/post. But as you know, when these papers get reviewed, it's when there's one limitation that

kind of—the explanation kind of stops there. But if I remember, and I don't know where our folks are that can—they can comment on that.

I think, I remember in our discussion, that there weren't any that were excluded just based on dietary intake. Like the three-day collections.

Is that true?

Laural English: That is—there were some that were excluded because they did not capture three 24-hour periods in their assessment. I think there were some that were also excluded because they didn't assess baseline eating frequency when they enrolled subjects in the study. So, they often had the follow-up assessment of adherence, but they didn't capture baseline eating frequency at the point of enrollment in the trial, or they didn't report baseline eating frequency.

[2:06:57] ***Dr. Kathryn Dewey:*** Again, I'm not focused on the observational studies right now. I just want to know if the randomized control trials, were any excluded because of these issues?

Laural English: Yes, that was in reference to the randomized control trials.

Dr. Kathryn Dewey: Okay. So, for me, at least, it would be helpful to have a little more information on those, because they're a much stronger study design, and I'd just like to see what they were about, if possible.

And then, the other question was, that one randomized control trial that you did mention, can you tell us any more about that one?

Dr. Steven Heymsfield: Rick, any information about that one?

Dr. Richard Mattas: It was a very small study. It was—I think they called it a pilot study.

Laural English: Yeah, correct. There were 45 subjects analyzed in 2 groups, where they compared a 3-meal group, so 3 meals per day, versus a grazing group, which was instructed to graze by eating 100 calories every 2-3 hours. So, that was sort of the general gist, men and women, but small sample size overall, and the results that Steve described on the slide.

[2:08:00] This one, it might be worth noting, that they did not adjust or control energy intake in this trial. So, the 3-meal group did have statistically significant lower energy intake than the grazing group, so that supports Rick's point earlier about energy intake increasing with increased eating frequency.

Dr. Kathryn Dewey: But that's sort of the point, isn't it, that that's an intermediate variable that—I wouldn't call it a confounder, and I think it's an important observation if that was the case.

Laural English: Correct, yeah.

Dr. Kathryn Dewey: Thanks.

Dr. Ronald Kleinman: Elsie?

Dr. Elsie Taveras: And I think similarly, is it right that there was just one study in children? Is there more information about that one? Because the inverse association is somewhat paradoxical. Is there any more information about sample size, what age the children were, where the exposure was assessed?

Dr. Regan Bailey: This is kind of similar to that. It might be related to physical activity.

[2:08:58] So, the more frequently you exercise, you eat more frequently. I mean is that captured in any of this literature?

Dr. Richard Mattes: No.

Dr. Teresa Davis: Okay.

Laural English: Elsie, to answer your question, the data from that analysis were from the NHLBI Growth and Health study, so it was 9-10-year old females only. So, it's a pretty limited population in terms of just girls and just at 9-10 years of age. And there were about 2,000 subjects in the analysis.

Dr. Richard Mattes: If I can just follow up on your point—

Laural English: And they adjusted—

Dr. Richard Mattes: Sorry. The questions about the association between eating frequency and body weight change or energy intake truly are two-tail tests. You can make very reasoned hypotheses in either direction. So, neither one should sort of stand out as unexpected.

[2:10:00] But we don't have the data to say which is more valid.

Dr. Heather Leidy: Just another I think clarification point, if I remember correctly, that the intake data was also different at baseline before they even started the intervention with the 3 versus grazing. Is that correct?

So, it wasn't that, over time, when the pre/post assessments were different at intake, at least some of these studies, they actually didn't adjust for intake at baseline, and they were in fact different at baseline.

If not this study, I know there were a few others that we reviewed where that was the case, so that they weren't adjusting for the differences at baseline to begin with, which was a confounding factor.

Dr. Elsie Taveras: So, Heather, does that mean that the exposure was measured at one time and not longitudinally, or a change in the—

Dr. Heather Leidy: Well, it depends on which study. In the kids' study, they did measure it at baseline, and then post-study. I just can't remember. There were a few studies that I'm getting mixed up on with baseline though, that their intake data at baseline was different, but that wasn't adjusted for as a covariant in the model.

[2:11:03] And so, it raises a question, because they were starting—they had different intakes at baseline before they had the intervention.

Dr. Elsie Taveras: So, how consistent the pattern was in the follow-up period?

Dr. Heather Leidy: Right.

Dr. Ronald Kleinman: But it also raises the question about how reliable you're capturing their eating frequency when you have a 10-year study and you measure it twice.

Dr. Steven Heymsfield: Right, exactly.

Dr. Ronald Kleinman: So, I think it's a challenging outcome with a lot of challenging methodologic aspects to the study itself. Is that fair?

Dr. Richard Mattes: Yeah, I think it's fair to say. And the evidence on trends in eating frequency are very strong and clear. We have increased, in adults, probably 1 ½ ingestive events a day as a population, which is remarkable.

[2:11:58] And 1 eating event a day in kids. So, if you don't track that over time, you've missed a great deal of information.

Dr. Ronald Kleinman: Rachel?

Dr. Rachel Novotny: So, just as a clarification, I may have missed it. So, was water considered an ingestive behavior then?

Dr. Steven Heymsfield: Yes.

Dr. Rachel Novotny: So, we—so that may also be something that's changed in how we've measured this across time, I'm assuming.

Dr. Steven Heymsfield: Yeah, that's right.

Dr. Richard Mattes: It is an ingestive event, in our opinion, but it was not a criteria by which we excluded a study, because we recognize people just have not been recording that. There would have been on studies to review if we had used that as a criteria. We think it's important going forward, but we didn't impose that as a standard here.

[2:12:59] Dr. Ronald Kleinman: Other comments?

Dr. Steven Heymsfield: I think we're getting more data from cellphones. People take pictures and they can record time and what they ate and so on. And so, there have been several very prominent papers on eating frequency in relationship to cellphone use and so on, in small populations, but there will be more data on this subject.

Dr. Carol Boushey: Yeah, I think that really is an excellent point, because what's going to—with mobile-based methods, we will be able to get more information on this very topic, and it's going to be one of the best uses of being able to have these images, and it was because of this committee, going back and looking at all of our images that we have, and I can't reveal anything because it's all—we're not finished yet, but it's been pretty interesting.

[2:13:58] Dr. Ronald Kleinman: Alright, Jamy.

Dr. Jamy Ard: So, Jamy. One other question on the results related to the 5 studies in adult, where 3 studies were positive, or had a positive association. I think you mentioned that there were challenges because they used a variety of different measures or outcomes related to growth, size, and body composition.

Were any of those—did any of them have any similar outcomes across those 3 studies, or are we talking about differences in sub-cu fat versus weight or BMI?

Dr. Steven Heymsfield: I want to say they were mainly BMI, as I recall. Maybe we can get an answer to that? But I think they were primarily BMI.

Dr. Ronald Kleinman: Alright. So, what's next?

[2:15:00] Dr. Barbara Schneeman: So, what's next is more general committee discussion, again, and we do have time before the lunch break. So, again, we heard quite a few of our subcommittees yesterday, the additional two today. So, I'd just like to take whatever time we have to kind of go around. And I'm going to strategically start with Jamie.

So, again, any observation relative to the subcommittees you've been hearing from, but also, as you think about it in the larger context. It's just helpful for our overall discussion.

Dr. Jamie Stang: Yeah, I haven't had much time to think about this, but I think what keeps coming to my mind is how con—how consistently each of the committees are saying that there's some very specific limitations, particularly around assessment of diet. And I think that as we think about this individually as committees, then thinking about what that is that is cutting across all of these committees, and that those should be our real big priority recommendations for moving forward.

[2:16:09] ***Dr. Barbara Schneeman:*** So, Elsie?

Dr. Elsie Taveras: Nothing to add, no.

Dr. Barbara Schneeman: That's fine.

Dr. Richard Mattes: I think some of the most telling analyses are coming from the food modeling and the food pattern groups, and the message seems to be that there is something about the totality of the diet that is meaningful and a target for making recommendations that could indeed have some impact.

And that being true, I just want to kind of repeat myself from yesterday, that we don't eat nutrients, we eat foods, but we choose foods based primarily on palatability.

[2:16:55] I mean in the US, we have the luxury of spending less than 10 percent of our discretionary income on food. As a result, we can just pick foods we like. We're not forced to eat foods that aren't necessarily palatable, but it's the way to get sustenance.

And so, I think it's very important, going forward, for us to put food choice into the recommendations we're making and the determinants of that. Some of it is public health, and access to food, and so on, but a fair amount of it is also the issue of palatability, familiarity, and so on, and we should be mindful of that.

Dr. Barbara Schneeman: So, Lydia? I'm coming around.

Dr. Lydia Bazzano: I didn't have anything to add.

Dr. Barbara Schneeman: Okay, great. Joan?

Dr. Joan Sabate: Regarding the last presentation, is interesting to see the results as far as the frequency of eating, but unfortunately, since that was not your primary question, I mean the thing that is more now of interest to the general public, that is the timing of eating and intermittent fasting, I mean was not considered.

[2:18:15] So, I'm afraid that maybe the general public will get no guidance from this committee at this point that I think this is an urgent issue, because it's becoming very widespread, not only in the popular media, but I mean in many segments of the population.

That's one aspect that we really certainly have to include in the next *Dietary Guidelines* on that.

The other issue is clear, based on the presentations yesterday, that the average American diet is—needs much food improvement, that it is across each age segment.

[2:19:05] That is not any particular age. It is for both genders. And I would say that this pretty much across also ethnic or social groups.

So, the task that this committee has to do is to put things quite clear, I mean for the general public.

We all know that information is not enough to change, but at least present things in a very clear way.

And in judging the reflection after the presentation of the dietary patterns to which the conclusions, I noticed that, and that is not the intention probably, but that was the situation, is that the foods that we conclude, that build a good dietary pattern, or healthy dietary pattern, such as fruits, vegetables, legumes, very little consumed by the American public, nuts, so on and so forth, are mentioned only once.

[2:20:09] I'm saying on the slide.

However, meat, that we say has to be drastically reduced, I mean is mentioned eight times. I know that in the context of high versus low, and lean and all this, but I mean just from the psychological impact, anyone reading these recommendations, if a word is repeated eight times, and other words is only repeated once, I mean the implicit psychological message is that one food is much more important than the other one.

So, we have to be aware in the way that we deliver the message, even though everything written, I subscribe and I agree, and I think is appropriate, I mean just the psychological impact, I mean in how we deliver the message, I mean may have tremendous effects. So, we have to be careful in the way that I mean we phrase our recommendations.

[2:20:59] ***Dr. Barbara Schneeman:*** Heather?

Dr. Heather Leidy: Heather Leidy. Just a comment for clarification from the Eating Frequency subcommittee. We did in fact include studies, well we sat out to include studies that had meal-skipping or intermittent fasting. They didn't meet our criteria. So, it wasn't that they were excluded because they were an intermittent fasting or meal frequency, but if they didn't include 24-hour eating—documentation of eating frequency over a 24-hour period, they were excluded.

So, just a point of consideration. It was part of our what we sat out to do, but there were no studies that adequately documented eating frequency across the day. And so, just a point with that.

And then, just some other things that came to mind. Kind of going on to what Rick had said, we think of it in terms of dietary patterns, and then it's really about recommending the foods. But then, I think for us, it's then people are eating foods, but then there's very specific times that they're eating them.

[2:21:56] And so, it's how much they eat them at one eating occasion and what time?

And so, I think that's why, just going back to eating frequency, I think that it is an extremely important topic, along with timing. The data right now just isn't—we're not able to put that in. And I think in some regards, it comes full circle, right?

Back in the day, there were examples of what a day should look like in terms of meals and snacks, and what the foods are within that. I think we've gotten away from that and focused about dietary patterns, which are important, but then I think from a general public standpoint, it's really here are the foods that are the most healthful and we're recommending them, but then that next piece is well, how do you get them into your—the timing and the frequency?

How do you make that more optimal? And we're just, I think from what we've gathered so far, we're not at that point yet, but I think that's really a good future recommendation.

And then, another part that our Eating Frequency subcommittee always joked about is there's a lot of data that we're—that we think is out there, from an eating frequency standpoint, but the articles that are published didn't report them.

So, anybody that has—generally, anybody that has 3 days, 3 days of eating, whether it's a food record, or recalls, they have the eating occasions.

[2:23:04] But when you look at the publication, that wasn't their point of examination.

And so, it was really about energy and macronutrient composition and so forth. And so, we said there might be a lot of retrospective analyses coming out from something like this, but there is a lot of data, I think, that's there. It's just not published in that manner. So, even just recommending the thought of thinking in terms of eating frequency, I think can be really helpful.

Dr. Jamy Ard: Jamy Ard. So, a couple of thoughts related to this morning, or maybe some integration from conversations yesterday. So, I think it's a big deal that we actually have all-cause mortality as an outcome, and we've got a really nice body of literature related to that. That is the ultimate outcome, right?

[2:23:56] And I think being able to speak to that in a way that has a strong level of evidence behind it with regard to the grade is something of an anchor point, potentially. And then, building on that, if we think of the diet pattern concept as being an organizing theme that then goes from that, it's related to a very strong outcome, positive effects, consistently.

And from Rick's earlier question about this idea of being able to quantify the dose response relationship in being able to give a sense of a public health type of impact, in the same way we know by reducing blood pressure by 2 millimeters of mercury across the population has these projected large impacts on cardiovascular disease events.

[2:25:01] If we were able to incorporate some type of assessment that says we shift the population intake in this way, towards a healthier pattern, again, whatever it's called, then

that has the potential to have these types of public health impacts on chronic—nutrition-related chronic disease and longevity.

I think that's pretty important to be able to try to get to.

Dr. Barbara Schneeman: Teresa?

Dr. Teresa Davis: So, I think that it's important to note that, over the course of the discussions today and yesterday, that there's been very limited or insufficient evidence to answer many of the questions that have been posed to us and that which we've been asked to address to this very limited evidence.

[2:26:03] And so, this gives us an opportunity to provide the scientific evidence for the questions that have been posed.

And then, to talk about the research needs that the scientific community can address. Where do we need to go in the next few years to answer some of these questions so that there will be the scientific information available for the next Dietary Guidelines Advisory Committee?

Dr. Steven Heymsfield: I actually had a very similar comment, and I've been thinking, of course, about frequency of eating, and I'm a clinical investigator, and these are questions you could answer in your sleep if you did a randomized experimental study, and why haven't they been done, and think about that a little bit more.

[2:26:58] Who would fund something like that? The USDA should put some money towards doing these kinds of studies, because you think about really what gets funded in science, basic science, molecular mechanisms, so on. It's very hard to get funding for doing a study like that.

So, we depend on these huge observational studies that have fuzzy data in them, very hard to come to conclusions. But one good really careful randomized trial like this, you could answer a big question. And there must be some other studies out there, people thinking about this a lot with time-restricted feeding and so on. There's some—a lot of data coming out like that.

But I think that we can encourage really good careful studies coming out of this type of work. That's my thought.

Dr. Barbara Schneeman: Great. Next?

Dr. Linda Van Horn: I also agree that we need to find new places for funding, especially for clinical trials.

[2:27:56] I think too, and this is echoing back to what Jamy said, and I was thinking about this too before he actually mentioned it, the idea of coming up with what I might call some sound bites from our research that would talk about the public health impact of things

that we're finding, I think is incredibly important and something we should think about, definitely with dietary patterns. Sorry.

Dr. Elizabeth Mayer-Davis: I'm afraid to touch that now. Yeah. Beth Mayer-Davis here. So, I had a couple of thoughts about what we will sort of do with our notion of dietary patterns and the hierarchy of patterns, foods, nutrients. And there's a couple of things I would think.

For our committee's consideration, as we continue to look at the literature, to look at the studies but with an eye to the dietary pattern, the ways of eating for the study, which may not be the focus, but to be able to say, "Well, what does it mean that this was a study conducted in Italy, this was a study conducted in a small community in rural America?" whatever it might be, so that we sort of keep in our mind what some of those implications might be, which is not something that can be done with scientific rigor, but I think would at least help us with our thinking.

[2:29:24] But we need to get to more scientific rigor with regard to this notion of patterns, and there's a couple of ways to do that, one of those being advancing statistical methods to deal with the hierarchy of nutrients, foods, and dietary patterns. So, there have been a small number of efforts towards this using methods like structural equation modeling and so forth.

And it's very challenging. I mean I will say that my research group has tackled some of this with some really smart biostatisticians, which I am not a biostatistician.

[2:29:57] And there are some real challenges with that, but I do think that that's an area of research that really would be very important, I think, at this juncture.

One thing that we can do possibly in the future for the next *Dietary Guidelines*, because there's only so much time in the day for Regan's committee to work, would be to think about, in various subpopulations, particularly subpopulations at especially high risk for certain diseases like type 2 diabetes, or certain populations where food access is a problem, so groups with lower socioeconomic status markers, to do some modeling in those groups to understand, "Well, what would be the foods of those that are actually consumed in those particularly vulnerable populations that are contributing to healthy or less healthy overall dietary patterns?" so that you can start to think about how some of this work would be translated relative to public health impact and effect.

[2:31:05] Another kind of practical thing is to think about food labels. We had some discussion at the break, thinking about really the utility, or potentially lack thereof, for a nutrient-based food label, and could that be complemented by, or getting really far out there, replaced by labels that are food-based, to help people in making decisions about food choices that aren't grams of carbohydrate, number of calories, and so forth?

Which in some individuals, that's important information. But just at least to complement that with maybe a much more food-based approach, thinking about wanting to provide assistance in guiding people with choices towards a healthier pattern.

Because you see some, if you look at labels of some of these bars, and people maybe are choosing "Oh, this has a higher number of grams of protein, and this is replacing my lunch, so I'm going to go for that," when really, the second ingredient is cane sugar.

[2:32:08] So, I mean, common on these labels. I confess I've looked at some of the labels.

But I do think that the whole purpose of this committee is about dietary guidelines for Americans, and how can we provide rigorous science-based evidence towards providing guidelines about what people could eat and how federal food policies can facilitate improved choices for people.

So, those are just some of my thoughts about how to get to this notion of dietary patterns, both from a scientific perspective and also from the perspective of implementation, eventually.

Dr. Barbara Schneeman: Thanks. Carol?

Dr. Carol Boushey: I really appreciated these ideas that everyone has come up with.

[2:33:00] They're—it's an enjoyable conversation to listen to.

I think I had gone over some of these yesterday, but it just sort of screams out.

Our food supply is changing constantly at the moment, and the beverages group really pointed that out. And I believe that we have to somehow try to start a system of documenting exactly what makes now a beverage, since we have more beverages now that are beyond soda.

It's an interesting phenomena. And it's rather complex. But somehow, if we can get it started, I think it will help moving into the future, because I don't see those going away.

And then, with frequency of eating, I do believe we have a responsibility to put in some guidelines to make sure that they—there's some type of—what would make the best approach to doing frequency of eating.

[2:34:11] And I do think that these mobile-based methods that we just talked about a little bit ago, they can capture the frequency of eating, and they also will give you a time stamp. And so, we weren't able to get that time stamp.

But that's the beauty of these mobile-based methods, to—if you're doing frequency of eating, all that can indeed be captured.

And, no, I think that's my last one. Yep.

Dr. Barbara Schneeman: Do you want to comment now, or do you want to comment later? I just wasn't sure of your timing.

Dr. Ronald Kleinman: Well, okay, I'll go ahead and follow Kay.

[2:34:58] Dr. Kathryn Dewey: Kay Dewey. Thanks very much. I wanted to comment a little bit on the point you made, Rick, about that, as a whole, Americans don't spend a large proportion of their income on food, but there are people for whom it is a serious issue. And I think for the healthy diets that we have looked at in the Dietary Patterns subgroup, we really need to look at the cost of those diets and the affordability for those that are low-income.

Some of the key foods, like seafood, are expensive. For nuts, other than peanuts, they tend to be a bit expensive. Fruits and vegetables, especially fresh versions.

So, I think it would be nice next step to work on the costing issue. Some research groups are doing that, and I think it's a responsibility we have to address the inequity in access to healthy diets in the US.

And then, in terms of the dietary pattern research as a whole.

[2:35:57] I'm thinking that it's a little circular, because many of the studies that said, "Here's a healthy diet based on what we knew 10 years ago, so we're going to score you on that basis," and then we say, "Is that score related to healthy outcomes?" But that's a score based on previous research, and now, we might know more, and we might score it differently.

So, it's a little hard for me to grasp exactly how this sort of rolling ball moves forward. And one example of that is the saturated fat part of the equation. I think there's more research now that is sort of distinguishing different types of saturated fat. They're not all the same.

And there's some interesting work on dairy fat from either milk or cheese or yogurt, and is it good, or is it bad, or how does it actually affect your body?

And then, my favorite example is chocolate, which has saturated fat, but I will maintain as a healthy food, apart from the sugar. And I'm just joking, obviously, but I think—

Dr. Ronald Kleinman: I'm not.

[2:36:58] Dr. Kathryn Dewey: I do think we need some research on different types of saturated fat in order to really home in on that question.

And lastly, in terms of frequency of eating, one thing I didn't hear mentioned is the issue of the macronutrient distribution within each eating episode. So, I know that, for example, for pregnant women, one piece of advice is to have each eating episode have a balance between fat, carbohydrate, and protein, that you don't want all carbohydrate, especially for things like gestational diabetes.

But I haven't heard that mentioned yet, and I think it's something probably the next DGAC would need to look at, but I would like to hear other people's thoughts about that.

Dr. Sharon Donovan: Sharon Donovan. I guess I was thinking about the life course, that sort of approach that we're taking. And I really am supportive of that, and Jamie's gone now, but her comment that our teenagers, our teenage girls, who are showing very poor dietary patterns and intakes, are our future mothers.

[2:38:07] And we have good biological plausibility that health really begins in the womb with epigenetics.

As part of this committee, we're not talking at all about microbiome, and that's an area that's clearly emerging. By the next version, I think, hopefully we'll have a better understanding of how diet—because that's really at the nexus between dietary intake and so many of our health outcomes.

And so, I guess there's kind of two comments. One, as we take our life course approach, I really do want us to think about starting at the very beginning, which involves that gestating mother, and her diet, and her preconceptual health. There's a lot of data on that in terms of obesity, maternal obesity status, and risk of childhood obesity.

[2:38:57] So, and I think our messages, as a government, should be that health begins in the beginning, and that the healthier that we can have our population, and the better consistent messages we can get, ultimately, it may be a while before this pays dividends, but we will see that.

But I also want to make a comment as that, as we broaden the B24 in particular, and pregnancy and lactation, two things. These are unique needs. And so, if we say that infants need a special kind of diet, it's because their needs per kilogram body weight, or that specific life stage, or women during pregnancy, are going to be different.

So, if we talk about different foods differently in these age groups, then there's a biological reason for that. So, we need to integrate, but we also need to understand these unique needs. And we heard, for example, in the elderly, maybe they're not getting enough protein. So, working that in.

[2:39:54] So, that's kind of where I'm thinking, as we start to integrate these new areas, how to integrate but also maintain the unique needs, and how those then can feed into public health recommendations and programs, to support your comment about, and mine yesterday, about food insecurity, and thinking about the example of the nice plate with salmon on it. It's like "Well, how many—" That's a very expensive food for very many people.

So, I think it's our responsibility to not just come up with the ideal diet. If it's, first of all, not palatable for many people, but we can train little kids to like foods, too. One of the systematic reviews involves even exposure in utero to flavors.

So really, I want us to think broadly, and I also want to say that, for our committees in particular, there's a lot of insufficient evidence for the specific questions that we asked. But there's still a lot of other government recommendations and a lot of other information out there about feeding children, and those will certainly be worked into our discussions.

[2:41:03] So, we'll represent the systematic reviews that we did, but we'll be working within the context of the broader knowledge in these areas.

Dr. Regan Bailey: I'll echo a lot of that. One thing I've been curious about is how we engage people to make different food choices. So, consistently across time, we've identified fruits, vegetables, whole grains, legumes, for you Joan, as foods to encourage.

But looking at the adherence to those, Americans aren't eating that way. And so, do we need to be working with behavior specialists or other types of scientists to help engage the public? Especially given the severity of the chronic diseases that we talked about yesterday, we really have to figure out some strategies to get people to change.

[2:42:00] ***Dr. Timothy Naimi:*** Tim Naimi, Boston University. I think it's been a really nice couple of days of meetings. I think the information we heard today from the Dietary Patterns provides a really nice—possibly a nice kind of a unifying theme, this idea about the pattern of the consumption, which is really about the quality of the food and more nutrient-dense foods, is kind of trumps specific nutrients or specific foods in terms of its importance.

And I think the good thing is that in this area, we do have relatively solid data, not perfect, we could use some more randomized trials, and it's a kind of—that thing about improving the pattern sort of works well across a number of different—using a life course approach, it works well when you focus on disparities, because again, a lot of these—the problems related to improving overall—the overall pattern of the diet quality, work well across all of those.

[2:43:15] And again, it works well in terms of addressing nutrients of concern, fats, salt, and sodium and added sugars.

So, I think it's kind of a nice unifying theme in an area about which there's pretty good kind of scientific agreement.

In terms of other things, though, it's—in terms of helping the public, the idea of making things very concrete for people, or really, if this is kind of our approach or a unifying theme, how we kind of put flesh on the bone for people in terms of thinking about changes that they could make.

[2:43:54] But then, in terms of actually making changes, as we know, unfortunately, that knowledge is only a small part of the equation, and the saying that every system is perfectly designed to get the results that it gets, the US dietary pattern is a perfect result of a system that is based on the prices of various foods, the physical availability of various foods, and all of these factors.

And so, whatever we contribute in terms of a knowledge base also needs to inform kind of how policies change, because I don't think that—telling the public is not enough to make a meaningful impact.

Dr. Rachel Novotny: Rachel Novotny. I appreciate everybody's comments. The one maybe additional area I'm thinking about is, as we move towards food patterning, or challenges really to do both the breaking down and the putting back together, I'm thinking about the methods for that, both for recommendations for research, as well as, importantly, for communication to the public.

[2:45:16] So, back to are we thinking of an expanded definition of food groups, now calling them maybe food components, and how do we name those and group them, and be sufficiently expansive and inclusive, but not overwhelming, and find words that are inclusive for different groups?

So, I'm thinking about what that looks like. And similarly, I guess in that vein, thinking about the term nutrient-dense. How do we really convey that? Is there like an index we could develop?

[2:45:58] But again, both for research and for communication, how does someone in a store identify a nutrient-dense food?

So, just some of the both practical realities, but I think they have research implications, too. The more we can develop these things, and even develop some commonalities in methodology so that we have a body of evidence to look at as we go forward.

That's what I'm thinking about right now.

Dr. Richard Kleinman: Yeah, so I really appreciate the framework concept that we've been passing around the table, around dietary patterns. And I guess I would come back to looking at how these patterns change over the life course, and perhaps, some conversation about priorities at different stages of the life course.

[2:47:03] So, we've been talking about all-cause mortality, and obviously, I'm pretty interested in that, although it may be too late. But if we look at it during pregnancy, for example, and lactation, we're really out to support mother's health and we're out to support growth and—optimal growth and development in the baby.

If we look at it in the baby, we're trying to support optimal growth and development, and that may actually be the first priority, at least for most parents it is. And that may coincide. We may be able to do that at the same time that we promote long-term health, but we should at least acknowledge that.

And there are natural periods of transition across life stage, of total dependence, independence, entering school, leaving the home, entering the workforce, and so on.

[2:48:06] And so, if we could find a way to perhaps refine the conversation about dietary patterns so that it appears that we've considered it as a continuous process that has somewhat different priorities, although the approach may be the same, then I think that's a way of relating what we're talking about to the consumer, either the parent, the child, or the adult consumer.

So, I think we're moving closer and closer towards an integrated approach, and I really like the way this is moving.

Dr. Barbara Schneeman: Great. I would agree that I think these comments are very useful, and I just hope I can figure out my notes when it's all said and done, because I've been trying to capture.

[2:49:03] And I really appreciate the committee being focused on their own work, but at this point, thinking about that work in relationship to what all of the subcommittees are doing, because at the end of the day, that's where I think our report can have its greatest impact of not just each individual scientific evaluation, but how does it come together as a whole?

So, I think we're ready to take our lunch break at this point, and we will start the public comments at 1:00 when we come back. So, I think that's—that'll fit well with the schedule, since we had the opportunity for discussion right now.

So, those of you who will be giving—I know they're going to rearrange the room, and there'll be a good process where we can go through.

[2:50:00] And by starting a little bit early, I know we had some people on the waiting list, but we might be able to include some of those. I'm looking back at Eve, and she's nodding her head.

Okay, so we will be back and starting at 1:00. Thank you.