Comments from Members of the SAB Mercury Review Panel on the draft (July 12, 2011) panel report, Peer Review of EPA's Draft National-Scale Mercury Risk Assessment

List of comments received

Comments from Dr. David Allen

Thanks for your efforts on this report. You've done a fine job of summarizing the panel's deliberations. I have only minor comments, listed below.

1. In the Executive Summary, it may be useful (for the SAB Quality Review) to state that the panel was provided with 14 charge questions, many with multiple parts, and that the Executive Summary will highlight the main findings, not detail the responses to individual charge questions.

2. Page 14, first partial paragraph - there is a dangling phrase or misplaced header "Overview Of Analytical Approach"

3. Page 31, section 9.1.1, paragraph 2, first line. "EPA's observations about mercury deposition as depicted in TSD Figures 2-1 to 2-4 are supported by analytical results" While I agree with this statement for the modified Figures 2-1 to 2-4 that we received after the panel meeting, these Figures were incorrect in the original report. This sentence should be clarified.

Comments from Dr. Celia Chen

Typo: Letter to Administrator Jackson - 3rd paragraph, "founds" should be "found".

Use of term "methylmercury" and "mercury" in the Executive summary the throughout the document: Just as the TSD was very inconsistent in its use of methylmercury and mercury, the comment document of the Panel is also very inconsistent. We need to make sure that when we say "fish tissue methylmcury data" (p. 3, 2nd paragraph) that the data were in fact methylmercury. Most state and federal monitoring programs analyze total Hg. Even though >90% of total Hg in piscivorous fish is methylmercury, both the TSD and our comment on it should be accurate about what data were actually reported.

p. 4, 3rd paragraph: In the discussion of whether to exclude watersheds with existing fish advisories, it is true that studies show that most people disregard advisories and therefore, they should not be excluded. But they should also not be excluded because they should be counted in terms of their potential to expose humans to Hg since the idea is that reducing emissions would also reduce Hg in those systems as well.

p. 11, 1st paragraph: "Overview of Analytical Approach" does not seem to fit here and is not a title or a whole sentence.

p. 11, last paragraph, 2nd sentence: refers to the legend of Figure 2-6 indicating that almost 300 samples were from Western sites, however, the legend for Figure 2-6 doesn't appear two refer at all to westerns site nor does that map have the western part of the country.

p. 12 3rd paragraph: This paragraph shows the inconsistency of the use of fish methylmercury (1st line) and fish mercury (4th line).

Typo: p. 15 first paragraph, 3rd to last line, misplaced comma.

Typo: p. 21, 3rd paragraph, 2nd line: "byEPA" needs a space.

p. 24, paragraphs 4 and 5: Since the demonstration of nutritional selenium intake and reduced Hg effects have not been demonstrated in humans, these the prediction of accentuated adverse effects of high MeHg exposures in populations with poor selenium intakes seems premature to state and considering their selenium intake also seems premature as well.

p. 29, 2nd bullet: the second sentence, "The uncertainty in locations….", does not seem to make sense.

Typo: p. 29, 10th bullet "deposition n these watersheds"

Comments from Dr. Miriam Diamond

Review of "*Technical Support Document: National-Scale Mercury Risk Assessment Supporting the Appropriate and Necessary Finding for Coal and Oil-Fired Electric Generating Units – March 2011*"

Comments from Miriam Diamond
July 18, 2011-07-18

In general, the report is well written, relatively concise and clear about the major "take home" messages. In my review, page numbers refer to pages of the PDF, not the page numbers on pages.

The issue of the uncertainty in the mercury emissions inventory should be brought to the fore by inclusion in the Executive Summary. The issue is listed amongst sources of uncertainty in the response to question 12. As I comment below, the emissions inventory underpins the final results and "take home" message of the entire risk assessment. A major result of the Risk Assessment is that 5% (and up to 30%) of total Hg deposition is attributable to US EGUs in 2005 and drops to 2% in the 2016 scenario. This finding then is translated into US EGU-attributable risk. What is the source of the 95% of atmospheric mercury emissions? We discussed that the EGU emissions were probably best quantified, but the uncertainty in the non-EGU emissions becomes equally important when the results are expressed as a percentage of total emissions. During the public meetings we were provided few additional insights into the uncertainties in this inventory.
An example of the type of discussion needed is provided by the discussion of the fish tissue database that our comment discussed at length. Issues raised were differences in methods and protocols used by the variety of agencies from which fish tissue data were gathered, that could lead to not only uncertainties in the overall results, but also biases in, for example, spatial extent of elevated mercury concentrations. Is the same true of the inventory? Do the inventory data come from different sources that use different methods to derive estimates (e.g., emissions factors)? Might there be regional differences in the accuracy of inventory data? Might there be differences according to sector, e.g., greater accuracy amongst EGUs but lower accuracy amongst other emitters? Given the uncertainties, I recommend that this issue receive greater attention in our final report.

P1, "The SAB founds that..."

P12, bottom of page, "The Panel agreed that fish nutrients can potentially influence neurological effects associated with methylmercury...". I recommend replacing "influence" with ameliorate since "influence" does not convey the positive benefits that can accrue with fish consumption.

The Executive Summary is well written and encapsulates well most of the discussion. There is one nagging and potentially important point that's missing however. That point is whether the results make sense. While the Panel agrees with the overall method used (i.e., the scientific approach is defensible), the results of the analysis hinge on information – Hg emissions inventory of EGU and non-EGU sources – to which we are not privy and have no sense of its uncertainty. Thus, while we can endorse the method used, etc., the final results of the analysis could be wrong if the emissions inventory contains errors. At the end of the day, I'm left wondering what sources of Hg are contributing most of the risk in all watersheds since it isn't EGU-derived Hg. I recommend that the EPA "ground truth" model results for several watersheds. Do the results make sense?

P 23. "Researchers have developed empirical relationships for fish methylmercury concentrations using water chemistry and land cover data. These empirical relationships have been used to estimate methylmerucy concentrations for different fish species across states and regions." I suggest that references be added to this. Are the empirical relationships available to estimate fish Hg levels across all

types of water chemistries or are their limitations to the use of these relationships? Have the relationships (a few or many?) been well evaluated?

P 25. Paragraph starting with "The Panel recommended...." Typo end of sentence "... methylmercury levels where the sample size is one and provided a bound on the risk assessment,."

P. 15. "The Panel recommended that the document provide more detail (preferably in tabular form)...." I'm concerned about the amount of work involved with this recommendation (compiling information "...on the scope and purpose of each sampling program, methods used, the types of fish obtained,..." etc.). This could be an enormous effort! I suggest that the EPA first assess the relative magnitude of error introduced by this uncertainty and then judge whether this uncertainty merits the output of effort necessary to provide the information suggested. The information compiled (e.g., purpose of each program) will not necessarily better constrain the uncertainty in the analysis.

P29. The response to "Limitations/uncertainty associated with MMAPs approach and proportionality assumption". Two issues are presented in the response. The first is a critique of MMAPs and the second is the evaluation of CMAQ results. For example, "There are quite a few comparisons, for example, between mercury wet deposition as modeled by CMAQ and as observed by the Hg Deposition Network." These two points should be clearly separated in our response. The discussion of MMAPs relates to whether you can use the assumption of simple proportionality to translate from fish concentration A under deposition regime A to fish concentration B under deposition regime B.

P31. R-MCM has been evaluated on a population of watersheds, but not all that are covered in the Risk Assessment, e.g., highly turbid rivers. I would add the comment that R-MCM is very data intensive, but that this intensity makes running the model impractical. Furthermore, running R-MCM won't necessarily add additional insight into whether MMAPs is adequate because the key point to MMAPs is the assumption that the proportionality holds when the system reaches steady state. Few (one from ELA?) data sets would be available to test the efficacy of either model over time as a system responds to changes in loadings and has time to reach steady state. Thus, I am not convinced that "running an alternative model framework would provide additional reassurance that the Mercury Maps "base case" approach was a valid one..." (last sentence of answer to Question 9).

p. 31 typo, sentence "The R-MCM, a steady-state version of the .... and used byEPA..." needs space between "by" and "EPA"

p31, Answer 10. What is the basis for using the threshold value of 39.7 pounds of mercury reported under TRI as the criterion for including/excluding a watershed? The document states that the 39.7 pounds of mercury releases pertained to all media. How many watersheds were excluded using this criterion, that received mostly atmospheric releases of mercury?

P34 Typo. Period missing at end of sentence "....it is possible that the analysis in the TSD underestimates the impact of reducing..."

P 41 Our comment that "EPA's observations are generally supported by the data presented in the assessment report". Does that refer to total Hg deposition or do we believe that the EGU-attributable deposition and non-EGU deposition accords with our knowledge?
"EPA's observations about mercury deposition as depicted in TSD Figs 2-1-2-4 are supported by analytical results." What analytical results? Deposition flux, spatial pattern? These two sentences should be tightened up.
I suggest that the recommendation to add to the discussion of uncertainty the review of model performance, which should be separated out from uncertainties in the inventories (EGU and non-EGU).

P43. The sentence “Also, none of the panellists were aware of the role turbidity may play in methylation.” This sentence comes out of the blue in this paragraph. My recollection of the comment about turbidity relates to methylation potential, and how it might affect the assumption of the proportionality of fish mercury to atmospheric deposition, which is the basis of MMAPs.

p.44 “However, the panel suspects that the average mercury deposition rate that produces this incremental mercury concentration will be similar between the 2005 and 2016 scenarios.” In fact, this is true, it’s not a suspicion. It’s true because MMAP “works” strictly by ratios so that no additional information will change the proportionality between Hg deposition and fish tissue concentration between 2005 and 2016.

Comments from Dr. Thomas M. Holsten

I have one minor comment (probably not substantive) on page 20 line 6 - I think the (II) should be deleted so it reads "mercury deposited" not "mercury(II) deposited."

Also if it is not too much trouble I would like my middle initial added "Thomas M Holsen"

Comments from Dr. James Hurley

Page i. For consistency with others listed, please revise my affiliation with:

Dr. James Hurley, Director, Environmental Health Division, Wisconsin State Laboratory of Hygiene, and Associate Professor, Department of Civil and Environmental Engineering, University of Wisconsin-Madison, Madison, WI

Pg 2 (top). Do we really want to use the term "cursory" for our general overview of the quality of the document? That word can actually be stricken from that sentence and we would still get the same point across – that it was lacking critical details on methodologies. I just think that a reader of the report will probably spend most of their time on the Executive Summary and the term "cursory" might be a little too negative.

Pg 2 Ln 6. Replace "and what the results are intended to represent" with "and allow better translation of the results"

Pg 2 Ln 7. Replace "understanding" with "additional information"

Pg 2 Ln 11. Replace "findings. The Technical Report is wholly inadequate in providing this." With "and the Technical Report needs to be strengthened to provide this description."

Pg 3, ln 6. The sentence "The Panel noted that one disadvantage of smaller watershed size is that the number of fish samples with methylmercury data is diminished." might better read "The Panel noted that one disadvantage of smaller watershed size is that *within a given watershed,* the number of fish samples with methylmercury data is diminished."

Page 3 Paragraph 2 General comment on fish tissue methylmercury data.
I don't think that anywhere in the document, nor our response, have we mentioned that fish in the study were probably not all analyzed directly for methylmercury. It is highly unlikely that they were. Most agencies measure total Hg and assume that all Hg present in fish tissue is in the methyl form. This is a standard assumption in the literature, but we should state that fairly early in the report and the following reference would work best for our assumption that all Hg is in the methyl form:

Bloom, NS. 1992. On the Chemical Form of Mercury in Edible Fish and Marine Invertebrate Tissue
Canadian Journal of Fisheries and Aquatic Sciences Vol. 49, No. 5, p 1010-1017.

Page 3 par 3 line 6 – Replace "…the 75th percentile concentration will be underestimated," with "the 75th percentile concentration most likely will be underestimated,"

Page 7, par 1 – See discussion above for the term "cursory". Suggest replacing "The Panel had difficulty evaluating the Technical Support Document because it is much too cursory." To "The

Panel had difficulty evaluating the Technical Support Document because it lacked the proper detail necessary for full evaluation of the proposed risk assessment."

Page 14 par 1 and Figure 1.
I'm a little confused here, especially by the statement that begins in line 3: "Much concern was raised about the fact that **over half** of watersheds have only one fish sample with a fish tissue methylmercury concentration available."
Figure 1 shows that about 650 watersheds have only one fish methylmercury measurement. I assume that there are 2,461 watersheds used. That's not over half. Also, eyeballing the bars in the plot, they don't seem to add up to 2,461. We need to clarify the apparent discrepancy.

Page 40 – Table of Acronyms

Add the following:

BMDL
EPA
GEOS-Chem
HQ
IQ
M5RC
MMAP
NESHAP
PDI
R-MCM
SAB
SES

Comments from Dr. Leonard Levin
(Additional edits provided in separate pdf)

COMMENTS OF LEONARD LEVIN
EPA SAB Mercury Review Panel Draft Report

SUBSTANTIVE COMMENTS

	LOCATION IN DOCUMENT	SUBSTANTIVE COMMENT
1	[pdf page 1; cover letter page 1; lines 45-46; pdf page 12, draft report page 2, lines 8-10]	In at least two places (once in the draft cover letter, once in the draft report), nearly identical language is used stating unconditional approval of the risk assessment: [cover letter] The SAB founds that the risk assessment provides an objective, reasonable, and credible determination of the potential for a public health hazard from mercury emitted from U.S. EGUs. [draft report] With this understanding, the Panel viewed the risk assessment favorably, concluding that it provides an objective, reasonable, and credible determination of the potential for a public health hazard from mercury emitted from U.S. EGUs. That approval is then immediately negated by the detailed comments, recommendations, and cautions raised by the SAB Mercury Review Panel. Given that, the phrasing noted should be changed to: [cover letter] The SAB **FINDS** that the **DESIGN OF AND APPROACH TO THE** risk assessment **IS ABLE TO** provides an objective, reasonable, and credible determination of the potential for a public health hazard from mercury **CURRENTLY** emitted from U.S. EGUs. [draft report] With this understanding, the Panel viewed the **DESIGN OF AND APPROACH TO THE** risk assessment favorably, concluding that it **IS ABLE TO** provides an objective, reasonable, and credible determination of the potential for a public health hazard from mercury **CURRENTLY** emitted from U.S. EGUs. These changes will take care of the differences between design and execution of the risk assessment that are the subject of most of the comments we made. In addition, use of "currently" is suggested to reflect the heavy focus on present-day (pre-MACT, pre-Clean Air Act) emissions and their greater basis in data rather than the economic modeling that gets 2016 emissions. (This also corrects the typo in the cover letter phrasing.) It is important therefore to note that the Panel approved of the risk assessment design and procedure, but judged the execution and presentation as inadequate, and that the additional information presented by EPA technical staff at the Panel RTP meeting in June 2011 did not suffice to fully rectify the shortcomings.
2	[pdf-12, report-1, last paragraph]	Here and elsewhere near the beginning, it is not made clear exactly what the risk assessment consists of, which parts of the risk assessment are in the Technical Support Document (TSD), and whether [risk assessment]=[TSD] or is a subset, superset, etc.
3	All pages	Since such a large number of requests are made by the Panel to EPA for revisions, expansion, clarification etc in the TSD, it would be useful to prepare a summary

		of all such recommendations to EPA in a simple table, probably at the beginning of the Panel Report to EPA SAB. That would be a good synoptic view of what the Panel is requesting to make the TSD complete and satisfactory from what appears to be judged unsatisfactory at the moment.
4	[pdf-22, report-12, last paragraph]	The phrase "…there are some states that receive elevated mercury deposition from U.S. EGU emissions and…" seems broad and indefinite. What is meant by " elevated mercury deposition"? Does this mean any deposition above what would be present if no (U.S.) EGUs operated? Above natural background deposition? Or above some unspecified lower threshold value? Simply remove the word "elevated," which can ambiguously mean "higher than otherwise" or alternatively "unacceptably high."
5	[pdf-27, report-17, 2nd paragraph, lines 18-19]	Object to and disagree with the phrase "The risk assessment provided a thorough literature review and…" As was noted several times at the RTP Panel meeting, a number of relevant references were omitted in the TSD document, some of which would substantively change numerical estimates used in the TSD and risk assessment. Among these were peer literature citations with alternative cooking loss factors for fish mass, estimates of EGU contributions to putative IQ loss, etc. In some cases, the only literature that was cited on a topic was by EPA authors (on, e.g., cooking loss factor), while literature that was not cited, also by EPA authors, would have detracted from the TSD conclusions. Suggest omitting those words completely and changing the phrase to "The risk assessment used sources that reported daily consumption for populations of low socioeconomic status…"
6	[pdf-28, report-18, Question 8]	The Panel support for selecting fished waterways based on a minimum of 25 individuals from target populations may in fact be misplaced. Since sport anglers often select waterways based on their isolation, under-fishing, and lack of disturbance to the ecosystem, how is one to know whether subsistence anglers might choose waterways to fish based on the same criteria? In other words, it is difficult to wholeheartedly back a screening method that may be itself flawed.
7	[pdf-38, report-28, last sentence of 1st paragraph]	Disagree with the entire sentence: "Notwithstanding the sources of uncertainty inherent in the approach, the Panel was of the opinion that the analysis presented in the TSD is sound and reasonable." I feel we are unable to conclude anything about soundness or reasonableness without some quantitative assessment of uncertainty and variability in the component calculations, and the resulting risk results.
8	[pdf-39, report-29, "Hot spots" bullet]	The term "Hot spots" should be shown throughout in quotes; the term has never been defined with scientific precision, and is loosely used by EPA and others to variously refer to: any deposition above natural background; deposition above some threshold; concentrations focused on a single location [an actual definition used by a government speaker]; etc. The text for the bullet should read "Appendix F should address whether the Mercury Maps approach, as implemented, is adequate to characterize **THE EXISTENCE AND EXTENT OF** mercury hot spots
9	[pdf-40, report-30, lines 8-10]	Regarding adjustment between raw and cooked weight of fish: EPA relied on a single older study for this adjustment factor (1.5) in the TSD. Alternative and newer peer-reviewed papers were cited at the RTP Panel meeting that showed some mercury loss as well as fish mass loss upon cooking, and these alternative

		sources should be acknowledged and cited[1] in the Panel report. There are many other citations possible, so that the basic uncertainty in the value chosen by EPA, and whether that value is too high or too low, remain to be determined and should be determined before the TSD is deemed completed.
10	[pdf-46, report-36, top paragraph]	Sentence "The inclusion of sport fishers with relatively higher fish consumption rates could expand the size and extent of the targeted susceptible population" is an important and critical one. EPA staff that addressed the RTP Panel meeting acknowledged they knew of, but did not cite, some references that used recreational angler data to assess the mercury-IQ effect, and that assessed the small (<4%) contribution of EGUs to this IQ effect. EPA staff emphasized their focus on subsistence anglers, taken to be a different population. But some recreational anglers are also in the subsistence angler sub-populations, and modeling and data relying on recreational angler behavior is therefore relevant to subsistence anglers as well. EPA completely ignores these alternative analyses rather than extracting relevant numerical information on, e.g., consumption rates that could inform the TSD and quantify both variability and uncertainty in the TSD analysis. This lack of further analysis of existing data should be noted by the Panel and acknowledged by (and corrected by) EPA.
11	[pdf-46, report-36, last paragraph in Question 14]	This sentence is confusing and should be rewritten; suggest "While there are numerous **UNQUANTIFIED** sources of variability and uncertainty that are contained in the numerical estimates of potential risk, The variability and uncertainty do not **CONTRADICT THIS BASIC** finding.
12	[pdf-47, report-37]	Disagree with the final sentence, which appears to be stating what the Panel *would* find *in the future* after changes are made to the TSD by EPA. Suggest altered wording to: "…the TSD, **AFTER INCORPORATION OF** the recommendations of the Panel, **HAS THE CAPACITY TO MAKE** an objective, reasonable and credible determination of the potential for a public health hazard from mercury emitted from U.S. EGUs.

[1] AO Musaiger, R D'Souza, 2008. Archivos Latinoamericanos de Nutricion, 58, 1, 103-9; LA Farias, DI Fávaro, JO Santos, MB Vasconcellos, A Pessôa, JPL Aguiar, L Yuyama, 2010. Acta Amazonica; 40(4): 741-8

LESS SUBSTANTIVE COMMENTS, EDITS, ETC.

1	[pdf-12, report-2, 3rd paragraph]	Change to: "They noted that a number of measures of potential neurodevelopmental effects of methylmercury exist, some of which have greater sensitivity **TO DIFFERENTIAL MERCURY EXPOSURE** than **DOES** IQ loss."
2	[pdf-19, report-9, line 33]	"…(Boston Naming **Test**)…"
3	[pdf-19, report-9, line 36-38]	Need a cited reference for the phrase "..not highly correlated…" in " … the Psychomotor Development Index has been most sensitive measure and, while this is a component of the Bailey Scales of Infant Development, it is **not highly correlated** with cognitive measures."
4	[pdf-20, report-10, 1st line, last paragraph]	"There is no credible **alternative** …" [not alternate, which means "every other one" in a series]
5	[pdf-21, report-11, 1st line, last paragraph]	Since the Panel did not speak to all of the "authors" of the TSD, this line should be changed to read "The **TEXT** of the TSD acknowledge**S**, and this Panel agrees,…"
6	[pdf-22, report-12, first paragraph]	Text "…in about 20 lakes range by a factor of 10 (Wiener et al. 2006)," seems a bit clumsy, suggest altering it to read "… in about 20 lakes **VARIES** by a factor of 10 .." or "..**RANGES OVER** a factor of 10.."
7	[pdf-34, report-24, 1st and 2nd full paragraphs]	(Several instances) The term "omega-3" (as in omega-3 fatty acids) is modified to "n-3." This is primarily a Microsoft typographic problem. Suggest solving it by spelling out "omega" to change entries to "omega-3."
8	[pdf-36 and -37, report-26 and -27, last line page report-26]	The two figures now become Figure 3 and Figure 4; add reference text on page report-26 to read "…public meeting on June 15, 2011 and reproduced below **(see Figures 3 and 4, next page)**."

Comments from Dr. Jana Milford

ES, p. 2 The language "unsuitable in its present form" and "wholly inadequate" is too strong and is not consistent with the findings and tone of the rest of the document. I would suggest changing to "… inadequate in its present form to fully support agency decision making …" Also, please change "wholly inadequate" to "inadequate."

p. 7 Please consider changing the first sentence in the second paragraph of the response to "The overall approach used in the study is to estimate potential risk at a national scale, attributable to mercury released from U.S. EGUs and deposited to inland waterbodies, for recent (2005) and future (2016) emissions levels." The original sentence suggests the risk assessment was more comprehensive than it actually was.

p. 17 Response paragraph 3. The concern about seasonality seems overstated. Given access to a freezer or other processing, fish consumption may not be as seasonally variable as fishing.

p. 22 Please delete the suggestion about omitting watersheds with fish advisories or indicate that some panel members disagree with this suggestion. I don't believe it represents a consensus of the panel. EPA should not be ignoring potential risks just because fish advisories have been posted.

pp. 28 – 30 The response to q. 12 needs to be copy editted, as this section contains several typos.

p. 28 The bullet reading "Appendix F should identify meteorology boundary conditions from the model GEOS-CHEM, which that provides input to CMAQ " [sic] should be deleted. GEOS-CHEM provides chemical boundary conditions, not meteorology boundary conditions.

p. 29 Third bullet, second sub-bullet. As written, this bullet is problematic, because the Air Quality Modeling TSD itself provides only cursory and apparently erroneous information about CMAQ model performance. Perhaps this bullet could be dropped and the first sub-bullet revised to simply say "More detailed description of model performance and uncertainty in CMAQ, including references to existing evaluations of the model."

Finally, we mention the problems in the CMAQ-produced deposition maps a couple of times. Should we acknowledge the revised maps Zach Pekar provided us on 7/1/11?

Comments from Dr. Nicholas Ralston

2nd paragraph from bottom of page 24.

Furthermore, since selenium binds with methylmercury to reduce its bioavailability, but selenium availability can vary greatly between even ~~in~~ adjacent regions, diminishments in fish methylmercury concentrations may not be uniform across watersheds. A series of EPA-funded studies that have assessed mercury selenium molar ratios in fish across the United States, provid~~ing~~e information regarding watersheds containing fish that could pose accentuated risks to consumers. ~~as well as~~Those studies may also indicate ~~those~~watersheds that may be more amenable to rapid reductions in fish methylmercury contents. Selenium's inverse relationships to methylmercury bioaccumulation and toxicity may synergistically influence exposure risks in certain watersheds.

Comments from Dr. Stephen Rathbun

Substantive Comments:

1. Page 2, Line -3. Does this refer to selenium? Can we be more specific regarding what fish nutrients may potentially have neurologic effects?
2. Page 3, Lines -14 to -13. We may wish to remark that since the 75th percentile will be underestimated, the risk assessment will be conservative; i.e., yield underestimates of risk to subsistence fisher populations.
3. Page 7, Line -13 implies that we are making population-level inferences to the 88,000 HUC12s in the U.S. I would rewrite this to state: "to estimate the number and percentage of fish-sampled watersheds where populations may be at risk."
4. Bottom of Page 10. Why should we expect a larger decrease in the tails of the distribution?
5. Page 14, Lines 6-7. Could we make a precise statement indicating what percentage of watersheds only had a single fish sample?
6. Bottom of Page 14. The rapid increase in the estimated 75th percentile for small samples is likely to be a statistical artifact associated with estimating 75th percentiles when the sample size is small. The continued increase in estimated 75th percentile with increasing sample size suggests sampling is biased in favor of watersheds with higher fish Hg concentrations. For example, the detection of high fish Hg levels in a watershed may prompt states to put more fish sampling effort into that watershed.
7. Top of Page 16. I think that it would be difficult to provide much detail regarding the methods used to obtain fish samples given that each state likely uses their own unique methods.
8. Bottom of page 26. In addition to recommending that the figures be added to the report, we may also wish to recommend that they be accompanied by a written explanation of how the calculations were conducted.
9. In the discussion of uncertainty, we may wish to suggest that for each source uncertainty, the direction of its effect on the overall risk assessment be described at least qualitatively. For example, the small fish sample sizes results in underestimates of the 75th percentiles which propagates to conservative underestimates of risk.
10. Bottom of page 35. Here, we appear to be expressing a desire for population-level inferences, inferences which are clearly not possible using the available data. To obtain such inferences we would need to apply probability-based sampling designs to select watersheds for fish samples, and for sampling human populations to assess fish consumption rates among subsistence-level fishers, among other things.

Minor Comments:

1. Letter to Administrator Jackson. Page 1, Line -7 should read: "The SAB finds that …"
2. Letter to Administrator Jackson. Page 1, Line -5 should read "The SAB approved the overall design…" Remove the word 'of'.
3. Letter to Administrator Jackson. Page 2, Lines 8-9. There appear to be some data from all states. I would say that "… watersheds in some states with areas with relatively high mercury deposition from U.S. EGs were under-sampled due to lack of fish tissue methymercury data."
4. Page ii. Rathbun is Professor of Biostatistics. I was promoted about a year ago.

5. Page 1, Line 14 should read “specifically hazardous to children…”
6. Page 2, Line -16. Delete “to consider”
7. Page 3. Line 5 should read “suited to follow deposition patterns of a single source such as EGU, and increase the likelihood …” I would remove the word ‘relatively’ on Line 6 since this term seems somewhat vague.
8. Page 3, Line 12 should read “data are appropriate for the mercury …”
9. Page 3, Line -6 should read “available data”, not “data available”.
10. Page 4, Line -12. Should this be “Inclusion of several additional sources of variability and uncertainty was recommended”?
11. Page 7, Line -10 might read “for vulnerable subsistence fisher populations” deleting the material in parentheses.
12. Page 9, Line -7 should read “number of fish-sampled watersheds …”
13. Page 13, Line 12 should read “cannot be ascertained” instead of “is uncertain”.
14. Page 13, Lines -20 to -19. Replace ‘relationships’ with ‘models’.
15. Page 13, Line -18 should read “for different fish species at state and regional spatial scales.’
16. Page 13, Line -13 should read “…empirical models would contributed additional uncertainty…”
17. Page 14, Line 1 should read “…75th percentile is reasonable for the estimation of the methymercury…”
18. Bottom of Page 15 should read “…regarding the sources of …”
19. Page 16, Line -2 should read “…fish tissue data, which may or may not represent the fish in the watershed or the fish consumed.”
20. Page 17, Line -17 should read “…fish consumption rates…”
21. Page 20. Line 8 should read “substantiate the assumption”, remove the word ‘that’.
22. Page 20, Line -4. Remove the word ‘The’ in front of ‘Modeling’.
23. Page 21, Line 7. Replace ‘would’ with ‘should’.
24. Page 22, Line 2 should read “At a minimum, the uncertainty…”
25. Page 23, Line -2. Replace ‘slope’ with ‘power’.
26. Page 24, Line 13 should read “…it is applied in the TSD to …”
27. Page 24, Line -8. Remove ‘that’ in front of “have assessed mercury selenium…”
28. Page 28, Line -19 should read “…spatial variability in populations…”
29. Page 35, Item 4. Very substantial gold mining also occurred in the mountains of north Georgia, particularly in the Delonega area.

Comments from Dr. Eric Smith

Comments on review - items in italic are from the text

Pg 3 *but not the largest, edible fish, the 75th percentile fish concentration was selected for watersheds with more than one fish concentration value.*
Should this be one or more?

75th percentile concentration will be underestimated,
Prefer: percentile concentration will generally be underestimated. Or: is expected to underestimate

4.3 Can't recall if we discussed this but in some states lakes are not real lakes but are man-made. Virginia, for example, only has two natural lakes. Characteristics of these man-made lakes are quite different from natural lakes.

Pg 14: *only one fish sample with a fish tissue methylmercury concentration available*. -- do we want to clarify this to be ... concentration available for fish greater than x in.

Should we add a bit to the legend of figure 1
Figure 1. Sample size plot for lakes and rivers using Excel data provided to the panel. The x axis (groupN) corresponds to the variable N_observations_post_river that is the number of observations in the post period for data from rivers within the HUC. When sample sizes are 20 or greater, a category is used i.e. 20 corresponds to 20 to 25, 25 corresponds to 26 to 30, etc.

The figure is just for rivers, not lakes and rivers.

Figure 2: Comparison of mercury concentrations in fish as it relates to sample size in river and lakes combined using Excel data provided to the panel. The fitted curve is based on a loess smoother with smoothing parameter 0.2. -- the figure is just for rivers

Pg 15: assessment,. Drop the comma

Page 32 bottom. The first and third bullet seem contradictory. The first indicates limited coverage at high deposition sites, the third says that most of the sites have high mercury deposition. I would make the first one last and reword. Although many of the sites have high deposition, there are numerous sites that are expected to have high deposition but are not included in the study. The number of high deposition sites from this study should not be construed as the total number in the country.

Pg 36. Bottom. Change *he variability* to the variability. Remove the underline from *Despite*.

References
Line needed after Harris
Remove line after Oribel reference
Weiner reference needs title of article

Comments from Dr. Alan Stern

Edits provided in separate pdf file

Comments from Dr. Edward Swain

Overall, the draft reads much as I expected it to. I noticed the following:

page 1, beginning about line 17: The draft text reads:

> The contribution
> of U.S. EGUs to the HQ for each watershed was calculated by comparing U.S. EGU deposition rates with total deposition to the watershed, including other sources, assuming that the contribution of U.S. EGUs to fish tissue concentrations and risk is proportional to their contribution to total emissions.

The last word should be changed to "deposition," rather than "emissions," as fish tissue concentrations of mercury in a waterbody are thought to be proportional to mercury deposition in that waterbody's watershed, not emissions.

page: 41: in Oken et al. (2005), "Gillman" should be capitalized.

page 42: in Orihel et al. (2008) there should be no "H." in front of the title of the journal, "Environmental Pollution".

page 42: The complete citation for Wiener et al. (2006) is given below. (Note: It is important to completely replace the reference in the SAB draft, in that the draft reference has numerous errors, including misspelling of Wiener, incorrect volume, and incorrect page numbers.)

Wiener, J.G., Knights, B.C., Sandheinrich, M.B., Jeremiason, J.D., Brigham, M.E., Engstrom, D.R.,Woodruff, L.G., Cannon,W.F., Balogh, S.J., 2006. Mercury in soils, lakes, and fish in Voyageurs National Park (Minnesota): importance of atmospheric deposition and ecosystem factors. Environmental Science & Technology. 40, 6261-6268.

Comments from Dr. Edwin van Wijngaarden

I don't have too many comments, and they are all editorial:

* page 10, line 1: "or neuropsychological tests (as DISCUSSED by van Wijngaarden et al.,"
* page 10, line 11: "van Winjngaarden" should be "van Wijngaarden"
* page 10, line 13: "neuropsychological measures from the 9-YEAR FOLLOW UP OF THE SEYCHELLES CHILD DEVELOPMENT STUDY MAIN COHORT."
* page 15, first paragraph: some typos... "Furthermore, the Panel recommends that EPA..." without ","; two sentences later "provide a bound on the risk assessment." without ","
* page 24, line 7: "Seychelles CHILD DEVELOPMENT NUTRIENT STUDY that nutrients can..."
* page 28-30: comment - not sure how to fix this other than rewriting in prose, but the bulleted nature of these responses is inconsistent with how the responses to the other charge questions have been structured.
* page 35, line 34-35: revise "that continue to be above the RfD (or above a change in 1-2 IQ points after EGU emissions are removed, if this aspect of the risk assessment is retained)." to "that continue to be above the RfD (or above a change in 1-2 IQ points, if this aspect of the risk assessment is retained) after EGU emissions are removed.