From:	Axelrad, Don
To:	gilmourc@si.edu
Subject:	FW: Hg-sulfur link
Date:	Tuesday, October 07, 2008 1:57:36 PM
Attachments:	Brown et al. 2003.pdf

From: Rumbold, Darren [mailto:drumbold@fgcu.edu]
Sent: Tuesday, October 07, 2008 1:56 PM
To: Axelrad, Don; Orem, Bill
Subject: FW: Hg-sulfur link

Don and Bill:

I wish you would consider a section that does a formal causal analysis using Hill/Fox criteria (see below) --- please ck out how well this attached paper tells the story (starting on pg 112) using criteria that has widespread acceptance. I will assist in any way that I can.

Darren

From: Rumbold, Darren [mailto:drumbold@fgcu.edu]
Sent: Monday, February 25, 2008 5:34 PM
To: Axelrad, Don; Gabriel, Mark; gilmourc@si.edu; ted.lange@MyFWC.com; kalla.peter@epa.gov; Krabbenhoft, David; Orem, Bill; Scheidt, Dan
Subject: Hg-sulfur link

Hi All:

I'm sure that some of you were even more frustrated than I when some of the participants at the workshop stated that they failed to see a link between methylation /bioacummulation and sulfate. Nick even made a joke that Ramesh had waited to make such a comment until after the ACME team had left for the airport (though - I am sure his delay was not intentional).

I don't see how we can move forward to tackle the more controversial issue without a consensus that this linkage exists.

To this end, I recommend that someone pull together the necessary information, which has been presented time and time again in different formats and present in one place as a formal causal analysis – i.e., stepping through Bradford Hill's or Glen Fox's criteria (see below). I am sure each of you can immediately think of several published datasets that satisfy each of the criteria (I can think of a few with District data).

As an illustration of how powerful this can be - I have attached a paper by some USGS folks (that is required reading in my classes).

"The spatial-temporal variability in mercury methylation and bioaccumulation in the Everglades is determined principally by variation in the availability and biogeochemical processing of sulfur: the weight of evidence"

1. **Spatial correlation—Effects occur at the same place as exposure; effects do not occur with no exposure.**

2. **Time order or Temporal correlation—Effects occur with or after exposure.**
3. **Biological gradient or strength—Effects decline as exposure declines in the landscape. Similarly, effects decline as exposure declines over time (or effects increase as exposure increases over time).**
4. **Plausibility (mechanism)—It must be known how the stressor causes an effect in the affected organisms. This will determine whether it is plausible that the observed effects are a result of the stressor**
5. **Plausibility (stressor–response)—The magnitude of effect is expected on the basis of the level of the stressor.**
6. **Consistency of stressor–effect association—Repeated observation of effect and stressor is seen in different studies or different locations within the region being studied. In addition, information is available from other regions in which similar (analogous) stressors have caused similar effects.**
7. **Experimental verification—Effects of the stressor are observed under controlled conditions with concordance of these experimental results with field data.**
8. **Specificity of cause—The effect tends to be associated with exposure to a particular stressor.**

Ref:
Hill, BA. 1966. The environment and disease: Association or causation? Proc R Acad Med 58:295.

Fox GA. 1991. Practical causal inference for ecoepidemiologists. J Toxicol Environ Health 33:359–379.

And yes, I also think we need to do a better job at characterizing different sources of uncertainty – rather than simply leaving at “uncertainty”, but that would be most useful in the document that Frank and Ramesh was outlining during the meeting.

Ronnie’s email on the GEER conference prompted me to send this out, but this could just as easily be presented at some other venue, e.g. SFER etc.

Anybody interested??
Darren