



May 5, 2014

To whom it may concern:

Following are my comments on the December 2013 draft of “Detailed Scoping Report: Potential Public Health Impacts of Natural Gas Development and Production in the Marcellus Shale in Western Maryland”. I have divided my comments into more general observations about the strengths and weaknesses of the scoping report, followed by comments on some of the specific details of the report. I consider the proposed components of the impact assessment, the methodologies and data sources proposed to address those components, and the structure and presentation of the scoping report given the potential audiences.

Overall comments

In general, this is a well-crafted scoping document that clearly took into account the feedback and comments from stakeholders while recognizing the literature and activities to date for hydrofracturing health impact assessments (HIAs). It would be useful to put forth a conceptual model/influence diagram to better organize the pathways and document the interconnections among the various impacts; the outline of topics in the assessment plan and the related discussion is thoughtful but does not always reflect points of synergy or tradeoffs. In addition, there are a few areas in which the assessment plan seems to rely on data that could not necessarily achieve the goals of the HIA, where detailed analyses are proposed that cannot be clearly connected with evaluation of hydrofracturing impacts or mitigation measures, or where it is not clear exactly what data will be used. These issues are described in more detail below. That being said, this report provides a good foundation for the forthcoming HIA activities.

Specific items

- P. 3: Given the broad audience for this scoping report and the subsequent HIA, having a glossary of technical terms is an excellent idea. That said, it’s not clear why only types of monitoring need to be defined (versus all of the other elements of an HIA), and the definitions themselves are meant for more of a technical audience. If this report is targeting the general public or non-technical decision makers, “adipose tissue” should probably be “fat”, “dermal” should probably

be “skin”, etc. In general, the report is written at a fairly high level, and materials may need some editing if the objective is to inform non-technical stakeholders.

- P. 5: This is more of a structural observation than a content observation, but the scoping report leads with the areas of stakeholder concerns rather than a conceptual model put forth by the analytical team. It is beneficial to articulate community concerns (and important to make them central in the scoping document), but it would be more helpful to lead with the literature foundation and conceptual model that led to the consideration of certain pathways, and then to articulate how stakeholder feedback led this model to be modified or endorsed. In general, to quote from the 2011 NRC report on health impact assessment, “setting priorities [in scoping] considers pathways that appear most important from a public-health perspective and considers issues that have been raised prominently by stakeholders. Questions that are important from a public health perspective might include the severity of the health effect, the size and likelihood of the effect, and the potential of the effect to exacerbate health disparities”. Many of these components are absent from the scoping report. Much of p. 5-16 involve a summary of stakeholder comments, but not a reflection on what the scientific knowledge base is regarding any of these pathways. There are numerous checklists and other approaches in conventional HIA that allow for a clear presentation of why certain outcomes have been chosen, and the authors should utilize one of these approaches.
- P. 10: Related to the comment above, for citations such as the one in section 4.4.3, it would seem preferable to cite to the peer-reviewed literature than to a white paper from a website that has “ban fracking now” as one of its banners. Beyond the general rule of thumb to cite primary rather than secondary references, this would also seem important from a stakeholder perception perspective. Many of the observations made in the text and in the white paper are based on the peer-reviewed literature, so this is based on a solid foundation of evidence, but the authors should make sure to bring that evidence forward in a scoping report.
- P. 16: For the baseline assessment, it is important to focus on health issues/determinants that could be affected by the proposal in some way, rather than providing a complete assessment of community health (NRC, 2011). The list developed appears to reasonably fit the bill, but lacking a conceptual model or diagram, it is difficult to know if the analyses will bear this out (and some of the appendices appear to show a different and much larger set of indicators). For example, an emphasis on asthma, chronic obstructive lung disease, cancer, and cardiovascular disease presumes that these are the outcomes most likely to be influenced by HVHF and related mitigation measures. As these are major causes of morbidity and mortality in general, it is a reasonable list, but it is important to know which hazards are linked to which outcomes. The inclusion of a spatial analysis of proximity to gas wells and use of well water, cross-tabulated with demographics, is a very valuable component.
- P. 18: Just to reinforce points made in the document, it is extremely important not to categorize some impacts as “primary” and others as “secondary”, but rather to consider all impacts in a logical and consistent manner, consistent with a multifactorial conceptual model. The argument for excluding climate change, issues specific to occupational health, and direct economic impacts is sound and logical.

- P. 19: This is a strong list of dimensions to be considered in the impact assessment. As discussed in relation to some of the data streams, it is not immediately obvious that all of these elements can be looked at in any detail, given a lack of fundamental information. But this establishes a broad context for the work. There are a few specific pathways where there could be refinements. For example, the public safety pathway does not appear to include any direct safety risk associated with operations. Also, I don't know if seismic risks are relevant in Maryland, but they have been important elsewhere, and there may be other operational components that would carry safety risks. The lists of stressor pathways is very limited – stress related to potential divisiveness in the community given haves and have-nots often comes up, as does potential adverse impacts on other economic sectors. Noise is also a psychosocial stressor, so there is some overlap among the categories (again, a diagrammatic conceptual model would help here). Although they reflect the charge, numbers 6 and 7 on the list are vague and overlap considerably with other categories – what does it mean to look at the impact of cumulative exposures in this context? Is this an integration across numbers 1-5, and if so, how will cumulative impacts be assessed? It appears later that this largely relates to the equity analysis of industrial land use, but there are many other dimensions of cumulative exposures that may be pertinent (e.g., common influences of noise and various pollutants on cardiovascular endpoints). Similarly, a number of vulnerable populations are listed in the baseline assessment, but will the impacts on each of these populations be delineated, and if so how?
- P. 20: Related to comments above, it's not clear whether all of the analyses in the baseline health assessment will be relevant to the conclusions of the report. State level health data would have very limited utility, and county-level data only for the impacted counties (without comparators beyond the state level) may be hard to interpret. For all of the various vulnerability maps, each of these sociodemographic groups must either be vulnerable to health outcomes influenced by the exposures or have the potential for disproportionate exposure along a pathway relevant to HVHF, and the argument has not been made for everything listed. In general, as significant effort could go toward this characterization, some thought should be made of how the insights from the mapping and other comparative analyses would inform the report.
- P. 21: There is a very brief mention of conducting focus groups to understand how HVHF has influenced the health of communities in WV or PA. This is an excellent idea, but a fairly substantial undertaking – does the team of investigators have the time and resources to design the focus groups, recruit participants from afar, conduct the focus groups, and formally analyze the content using qualitative analysis techniques? This requires very specific expertise and would be a large time commitment, so the HIA team needs to make sure that the insights that would be provided would be valuable and not available through other means.
- P. 21: Focusing on literature linking HVHF and acute health outcomes, while important, appears too narrow as written. Perhaps it is implicit, but it should be explicitly stated that if you can argue that an exposure is connected in some way with HVHF, then the broader literature on the effects of that exposure would be incorporated. The preliminary list of literature on the website is almost entirely on the health impacts of HVHF. Somewhere it would be important to state that, for example, if HVHF is thought to contribute to ozone concentrations, then you would

summarize and leverage the full set of ozone epidemiology. These types of chained connections are crucial for an HIA, especially for a newer technology where the direct evidence will be limited.

- P. 22: Creating maps of all industrial facilities and overlaying these maps on census data is an interesting effort but one that may be challenging to connect with the question at hand. It appears that the presumption is that environmental justice issues for HVHF could be evaluated by looking at the demographic characteristics of those census tracts with a significant number of facilities at present, and considering whether vulnerable populations tend to be exposed to a greater number of facilities. But if the sites of HVHF activity tend to have lesser industrial activity to date, does that imply that there could not be environmental justice issues given the characteristics of the affected individuals? Proximity to facilities is also a poor proxy for exposures from those facilities – proximity-based environmental justice analyses tend to focus less on exposure burdens and more on procedural aspects of environmental justice (i.e., the fact that polluting facilities may be disproportionately placed in communities without political power). Whether this is the intent of this analysis is not clear, but this appears to be another example of a very interesting analysis but one that may not ultimately provide insight for the HIA being conducted. In general, it is important to include issues of disparities or environmental justice, but the terms of the analysis should be more precisely defined and more closely connected with the HVHF policy decision.
- P. 22: It's not clear how the use of NATA data necessarily informs the analysis either. Given both the timing of NATA (focusing on data only through 2005) and the fact that limited emissions data are available for HVHF, HVHF will not be represented in the NATA concentration data. This will give a general sense of the modeled ambient concentrations of air toxics in these areas prior to HVHF, but not much else. It's not clear if the subsequent text on proximity to well pads presumes a linkage with NATA or a stand-alone analysis – if the former, this would be hard to interpret if the well pads are not represented in NATA, and if the latter, the text should be clarified.
- P. 25: For each of the rows in Appendix 1A, the table should indicate the spatial resolution of the data as well as the spatial domain. "Area" only gets at the size of the domain, but not the resolution, which will be important for interpretability. It would also be valuable someplace to show a map of the counties in question with their census tracts and other details labeled, so the reader has a sense of both the spatial coverage and the limitations of data at various levels of resolution. Most readers will know where the cities and counties are, but may not have a sense of the size of census tracts, and others may not even be familiar with all of the cities listed.
- P. 25: As another general point on Appendix 1A, as mentioned above, all of the data in the baseline assessment should be directly tied in some manner to the proposal under study. The investigators should look at the list of indicators and think hard about whether all of these could somehow be connected with the HVHF HIA. Not every endpoint needs to be directly influenced by exposures tied to HVHF, but every endpoint must have a very specific reason for being there.
- P. 25: Is 1980 really the most recent year for which well data are available? This seems problematic in terms of the locations of wells and in the fidelity of chemical testing data.

- P. 29: For Appendix 1B, while the tables are clearly not meant to be all-inclusive at this point (as indicated in the footnote), it would be valuable to include at least some data related to HVHF impacts from the peer-reviewed literature or from locations other than Maryland. Inclusion of these data, with caveats or modifications to reflect conditions in Maryland, should increase the available data beyond the narrow set of information available solely from Maryland.

Please let me know if you have any questions or if any comments require clarification.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jonathan Levy', with a stylized flourish at the end.

Jonathan Levy
Professor of Environmental Health
Boston University School of Public Health