

Data Submitted (UTC 11): 8/29/2018 4:00:00 AM

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Comments: Packet #19: Noise: health, psychological well-being, cognitive and economic impacts from oil and gas operations must be assessed Blair, Hays and van Kamp papers

1. Public health implications of environmental noise associated with unconventional oil and gas development, Jake Hays et al. Science of the Total Environment 580 (2017) 448-456

<https://doi.org/10.1016/j.scitotenv.2016.11.118>

Abstract:

Modern oil and gas development frequently occurs in close proximity to human populations and increased levels of ambient noise have been documented throughout some phases of development. Numerous studies have evaluated air and water quality degradation and human exposure pathways, but few have evaluated potential health risks and impacts from environmental noise exposure. We reviewed the scientific literature on environmental noise exposure to determine the potential concerns, if any, that noise from oil and gas development activities present to public health. Data on noise levels associated with oil and gas development are limited, but measurements can be evaluated amidst the large body of epidemiology assessing the non-auditory effects of environmental noise exposure and established public health guidelines for community noise. There are a large number of noise dependent and subjective factors that make the determination of a dose response relationship between noise and health outcomes difficult. However, the literature indicates that oil and gas activities produce noise at levels that may increase the risk of adverse health outcomes, including annoyance [i.e., stress], sleep disturbance, and cardiovascular disease. More studies that investigate the relationships between noise exposure and human health risks from unconventional oil and gas development are warranted. Finally, policies and mitigation techniques that limit human exposure to noise from oil and gas operations should be considered to reduce health risks.

Excerpts from the report: Noise, or unwanted sound, is a biological stressor and potential public health hazard in a variety of contexts. Exposure to noise modifies the function of human organs and systems (Munzel et al., 2014) and can be a contributing factor to the development and aggravation of health conditions related to stress (e.g., high blood pressure) (Dratva et al., 2012). Numerous large-scale epidemiological studies have identified associations between environmental noise exposure and adverse health outcomes, such as cardiovascular disease (Babisch et al., 2013), diabetes (Sorensen et al., 2013), adiposity (Christensen et al., 2015), birth outcomes (Gehring et al., 2014), cognitive impairment in children (Lercher et al., 2002), depression (Orban et al., 2015), and sleep disturbance (Hume et al., 2012). Health outcomes due to environmental noise exposure may also carry economic consequences due to the size of populations exposed to hazardous levels of noise (Swinburn et al., 2015).

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"In a report prepared for the West Virginia Department of Environmental Protection, McCawley (2013) monitored noise levels associated with various stages of natural gas development from 2 to 4 sampling sites located 190.5 m (625 ft) from the center of five different well pads. McCawley (2013) provided actual monitoring results from a number of different sites and for a variety of stages in the development process, including site preparation, drilling, hydraulic fracturing, and truck traffic. Analysis of these data yields the percent of time particular noise levels were exceeded in minutes (Table 3 and Table 4). In all cases, for the five major operations the study surveyed, noise levels exceeded 55 dBA for N24 h, though not necessarily continuously.

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"There are a number of health damaging air pollutants associated with UOGD that have been measured in high concentrations, including volatile organic compounds (VOCs), aromatic hydrocarbons, particulate matter (PM), and ground level ozone (Helmig et al., 2014; Oltmans et al., 2014; P[er]tron et al., 2014). Some of these pollutants have been

shown to increase risk factors associated with heart disease and other adverse health outcomes. Numerous epidemiological studies have observed exposure to noise and air pollution simultaneously, since both often accompany transportation sources (e.g., busy roadways). It can be difficult to link one or the other to increased cardiovascular risks,

and correlated exposures may lead to confounding in some epidemiological studies. It is not entirely clear from the available body of science whether air pollution is independent, additive, or synergistic to impacts from noise exposure. Several papers have also acknowledged that light pollution resulting from nighttime UOGD operations may constitute an additional stressor and potential health hazard (Ferrar et al., 2013; Perry, 2013; Witter et al., 2013). Evidence suggests that light at night may impact health by disrupting normal circadian rhythms and altering melatonin and other

hormone releases (Chepesiuk, 2009; Pauley, 2004). There has also been some epidemiological links of light at night to breast cancer (Hurley et al., 2014) and obesity (McFadden et al., 2014), although the research is still preliminary.

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4.4. UOGD public health literature

"There is an emerging body of epidemiology that suggests an association between UOGD and adverse health outcomes (Hays and Shonkoff, 2016). In a study using over 95,000 inpatient records from three counties in northeast Pennsylvania, Jemielita et al. (2015) noted an association between density of unconventional natural gas wells and increased inpatient prevalence rates for a number of medical categories, including cardiology and neurology. The authors hypothesized that this association could be due in part to potential toxicant exposure and stress responses (Jemielita et al., 2015), the latter of which may bear particular relevance to noise exposure. Several other studies have

found associations between UOGD and some adverse birth outcomes (Casey et al., 2015; McKenzie et al., 2014; Stacy et al., 2015), which have also been associated with noise exposure. In light of these findings and our understanding of noise as a potential health risk factor for stress and adverse cardiovascular outcomes, additional research on noise

levels and noise exposure associated with UOGD is warranted."

Since fracking compromises health through a variety of channels -- ozone and chemicals (air pollution), compromised water sources, noise, disruption of rural quality of life, ground shaking, noxious smells and sights, light pollution, and fear, it doesn't really matter for this analysis whether noise and air pollution are actually synergistic, since they clearly both compromise health. The Wayne must assess costs to public health, quality of life, individuals' and community economic health, and wildlife of noise and all other impacts from fracking before considering fracking as a potential activity under the new Plan. This research paper must be reviewed in its entirety if fracking is to be considered by the Wayne for an activity to be included in its new Plan.

2. van Kamp I, Davies H. Noise and health in vulnerable groups: A review. *Noise Health* 2013;15:153-9

<http://www.noiseandhealth.org/text.asp?2013/15/64/153/112361>

"Conclusions: Vulnerable groups regarding environmental noise have been understudied, are generally underrepresented in study populations and evidence of differential effects is still highly anecdotal. As a consequence, clear effects are few and this is partly due to the lack of targeted and well-designed studies making clear comparisons between the general population and the potentially susceptible groups and quantifying these differences in terms of noise levels. Setting specific limit values to protect susceptible groups is not yet possible based on the available evidence, although some suggestions have been made in the literature. In the Night noise guidelines, [18] for example, it has been suggested that night time exposure levels above 40 dB more severely affect vulnerable groups.

"Effects of noise in schoolchildren are the best documented. The available evidence shows that children are less vulnerable for annoyance than adults, but more vulnerable for cognitive effects of noise. They are not per se more vulnerable as a group, but more at risk because of less-developed coping strategies, and they are in a sensitive developmental period. This is indicative of a life phase effect rather than an age effect. Children seem to be less vulnerable for awakenings due to noise but more vulnerable for physiological effects during sleep and related motility. There is some evidence that annoyance from both road- and air traffic noise predicts asthma prevalence in children (both self-reported and diagnosed). Evidence does not indicate that the elderly are more vulnerable to noise in terms of annoyance and sleep disturbance. Age-specific comparisons rather show an inverted U-shaped relation and indicate that both young and older people are less at risk as far as annoyance and disturbance are concerned. But, possibly, the elderly are more vulnerable regarding cardiovascular effects, and this may be a combined effect of air pollution and noise. [77] The role of noise annoyance and noise sensitivity in this relation is still inconclusive. Noise sensitivity-related effects might be part of a more generic vulnerability effect, which could be psychologically and/or physiologically based. Gender differences in terms of vulnerability for cardiovascular effects should also be further studied. A further distinction between susceptible people, places and periods might be useful for future research. More attention to specific groups at risk is warranted, such as the mentally ill, shift-workers and people suffering from tinnitus. Also, the distribution of noise over SES groups deserves more attention as well as the accumulation of exposures (noise and air), the accumulation of residential and work-related exposures and places with less opportunity for recovery from daily stressors (lack of restoration). It may also be fruitful to study the differential effects of noise from a more contextual viewpoint and take life course- and life phase-related aspects into account. This includes looking at studies into the health effects of noise in groups based on, e.g., social economic status, working situations and places. Assuming a joint effect of co-exposures like noise and air pollution, or different noise sources, studying susceptible groups based on these would shed more light on these joint effects. It would also include looking at specific susceptibility for noise during the life stages and an accumulation of risk during the life course. To further this field, it is necessary in future studies to present and compare subgroup-specific exposure effect relations."

This research paper must be assessed in full.

#3:

Benjamin D. Blair et al. Residential noise from nearby oil and gas well construction and drilling, *Journal of Exposure Science & Environmental Epidemiology*, May 2018

<https://doi.org/10.1038/s41370-018-0039-8>, <https://www.nature.com/articles/s41370-018-0039-8>

Abstract

Public concern about oil and gas (O&G) operations in residential areas is substantial. Noise from

construction and drilling to O&G operations may be greater than other phases of O&G operations; yet the impacts of audible and low frequency noise during these operations are not extensively explored nor the

effects on health well understood. This study documents the noise levels at a multi-well O&G well pad during construction and drilling in a residential area in Colorado. A-weighted (dBA) and C-weighted (dBC) noise measurements were collected at four locations during development over a 3-month period. The maximum 1-min equivalent continuous sound levels over a 1-month period were 60.2 dBA and 80.0 dBC. Overall, 41.1% of daytime and 23.6% of nighttime dBA 1-min equivalent continuous noise measurements were found to exceed 50 dBA, and 97.5% of daytime and 98.3% of nighttime measurements were found to exceed 60 dBC. Noise levels exceeding 50 dBA or 60 dBC may cause annoyance and be detrimental to health; thus, these noise levels have the potential to impact health and noise levels and associated health effects warrant further investigation."

Impacts on the community's health and well-being as well as potential wildlife impacts of this industrialization of the forest must be assessed if fracking is to be considered as a potential activity by the Wayne.

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