

COMMENTARY

Cholera Outbreak Investigation in Sokoto State – Nigeria, 2013

Jerome Nriagu, PhD, DSc
School of Public Health,
University of Michigan, Ann
Arbor, MI 48109

E-mail: jnriagu@umich.edu

Corresponding Author:
J. Nriagu, as above

Keywords:
Niger Delta,
Poor Mental Health, Pollution,
Toxicity

Abstract

Poor mental health is a risk factor for the incidence and prognosis of many diseases and strategies to prevent or control the growing burden of disease in the Niger Delta should address the silent epidemic of co-morbid mental illnesses likely associated with exposure to oil pollution.

There are two principal causal mechanisms by which oil pollution affects human health. One is exposure to toxic constituents in crude oil that directly damage health, and the other is the neuropsychological (indirect) pathway that works through perception of risk, worry, chronic stress and poor mental health that result in poorer health outcomes. The division between the so-called “objective” and “subjective” approaches to the problem of environmental health is very artificial but has tended to guide the various research agendas. Most of the studies on the health effects of oil pollution in Nigeria are of the objective type (Adeola, 2000; Ordinioha and Brisibe, 2013), presumably because of the local association of the risk of exposure with potential toxicity of over a thousand different hydrocarbons in crude oils. Some of these crude-oil components are known to cause respiratory, hepatic, renal, endocrine, neurologic,

hematologic, or other systemic effects; however, the adverse effects are manifested only at high doses. Exposure to toxic doses of crude-oil constituents occurs presumably in the immediate vicinity after an oil spill and among workers engaged in unsafe working conditions (Cutchin *et al.*, 2008; Goldstein *et al.*, 2011; Gay *et al.*, 2014).

Although the effects of large accidental oil spills on the environment and human health have been extensively studied in different parts of the world (reviewed by Aguilera *et al.*, 2010), the results of such traumas are not directly applicable to the Niger Delta where the oil pollution is an ongoing chronic disaster and an environmental adversity. An interesting outcome in large oil spills is the psychological distress known as Posttraumatic Stress Disorder (PTSD) which is not generally encountered in communities with chronic exposure to oil pollution. By

contrast, the chronic nature of the oil pollution in Nigeria and its associated environmental and social impacts are likely to have more insidious impact on one's physical and mental health which are different from those of discrete traumatic spills (Campbell, 1983; Gay *et al.*, 2014]. Currently, there is little information on the multidimensional elements of exposure and health outcomes in communities with oil pollution in the Niger Delta although the recent study by Nriagu *et al* (2016) has started to shed some light on this issue.

Nriagu *et al* (2016) studied 600 subjects selected from five local government areas in Akwa Ibom State where oil pollution is rampant. A structured questionnaire was used to collect the data on the respondents' exposure to oil pollution, self-rated health and disease symptoms, perception of risk of exposure and emotional reactions to local oil pollution. Most of the participants lived in areas with visible oil pollution and/or near gas flaring facilities and were regularly exposed to oil in their environment. This study found high levels of disease symptoms and environmental distress (worry, annoyance and intolerance) that were associated with oil pollution in the study area. Only less than 5% of the respondents had no adverse feelings about oil pollution in their community). By contrast, 81% of the subjects were very worried, 86% were very angry, and 72% were very fearful and a large majority (68%) was very frightened or very stressed (66%) about local oil pollution Nriagu *et al* (2016). High level of emotional distress was thus found to be part of everyone's life amongst the study population. The main explanatory factors for the emotional reactions were found to be risk perception, annoyance and intolerance about local oil pollution. Participants mostly associated the negative health effects of local oil pollution to be in the order: (gas flaring facility) > (oil contamination of drinking water) > (visible oil pollution) > (direct oil contact). This implies that risk perception in the study area was mediated, to a large extent, by dreaded hazards (catastrophic fears of pipeline explosions and oil spill fire), visual cues (gas flares and smoke stacks) and chemosensory cues (off-flavor in drinking

water). This information should be considered in developing any intervention measure to reduce the distress levels in communities of the Niger Delta.

Nriagu *et al* (2016) found the environmental disease burden (estimated using an inventory symptoms associated with exposure to environmental hazards) to be quite high in the study area; the average score for health symptom inventory (HSI) was 33 compared to the maximum possible total of 43. Self-reported symptoms with high prevalence rates included headache (96%), watery eyes (81%), sore throat (80%), respiratory problems (64%–83%), itchy skin (84%), rashes on face and neck (78%), sneezing, coughing or congested nose without a cold (83%), nausea (70%), dizziness (79%), chest pain (80%) and diarrhea (74%). This study was the first to report the high co-morbidity of disease symptoms and psychological distress with the two conditions independently associated with the exposure metrics for oil pollution.

Epidemiological studies now provide strong evidence for the associations between exposure to environmental oil pollution and impairments in psychological and pathological health of the local populations (Nwoke, 2011; Akinbobola and Njor, 2014). The processes that may account for the reported exposure-disease relationships in oil polluted communities are still poorly understood. Emerging concepts in recent research point to two processes that can mediate the effects of environmental exposures to oil pollution on pathological and psychiatric health: (a) the prolonged physiological activation and (un)conscious preservative cognition from rumination and worry and (ii) cumulative cost represented by dysregulation of multiple interrelated physiological systems (allostatic load) from chronic exposure to low-dose stress and/or toxic oil constituents. The two processes are closely inter-connected (Figure 1). In daily life, it is not the stressful events themselves but the sustained cognitive representation of the stressors that is likely to cause prolonged physiological activity, which is believed to lead to pathogenic changes and finally somatic disease. The human ability to make cognitive representations of past stressful

events (rumination) or feared events in the future (worry) is called preservative cognition (PC). PC has been associated with increased activity in hormonal responses and several bodily systems, including the metabolic, cardiovascular, endocrinological and immunological systems and hence are risk factors for a range of psychological and pathological syndromes (Brosschot *et al.*, 2006). Allostatic load (AL), on the other hand, pertains to “fatigue” of physiological systems from prolonged exposure to low-dose toxic chemicals and/or from repeating cycles of stress arousal, stress response and post-stress adaptation (Rosenberg *et al.*, 2014). It is the consequence of regulatory wear and tear on the body and brain, which can lead to illness (Beckie, 2012). There is a compelling evidence that heightened AL is consistently associated with numerous medical outcomes, including cardiovascular disease, psychiatric symptoms, cognitive decline, physical limitation and neurological disorders (Goldstein *et al.*, 2011; Gleit *et al.*, 2013). Significant associations have also been reported with several inflammatory, metabolic and stress biomarkers as well as with testosterone and oestradiol (Beckie, 2012; Mattei *et al.*, 2010; Ramsay and Woods, 2014). One can argue that mental illnesses are risk factors for the burden of

pathological diseases in the study area and that the co-morbidity of these conditions is etiologically complicated by perseverative cognition and excessive allostatic load.

Besides the costs of medical treatment for oil-related ill health, the influence of exposure to oil pollution on undesirable psychosocial behavior needs to be mentioned. For example, patients suffering from mental illness are twice as likely to smoke cigarettes as other people (Lasser *et al.*, 2000); Nriagu *et al.* (2016) reported that 17% of the participants smoked regularly and this rate may be rising. Of particular significance to the region is the fact that environmental distress is among the instantiations considered to be risk factors for aggression through loss of self-control (Denson, 2012; Denson *et al.*, 2011). People who show heightened aggressive cognition, physiological arousal, and anger tend to make hostile attributions about others' behavior (polluters in the Niger Delta for instance), which heightens their tendency towards aggression (Ehigie, 2005). Whether there is cause-effect relationship between exposure to oil pollution and high level of violence in the Niger Delta as well as the hostility towards the oil producing companies is an intriguing question for further research.

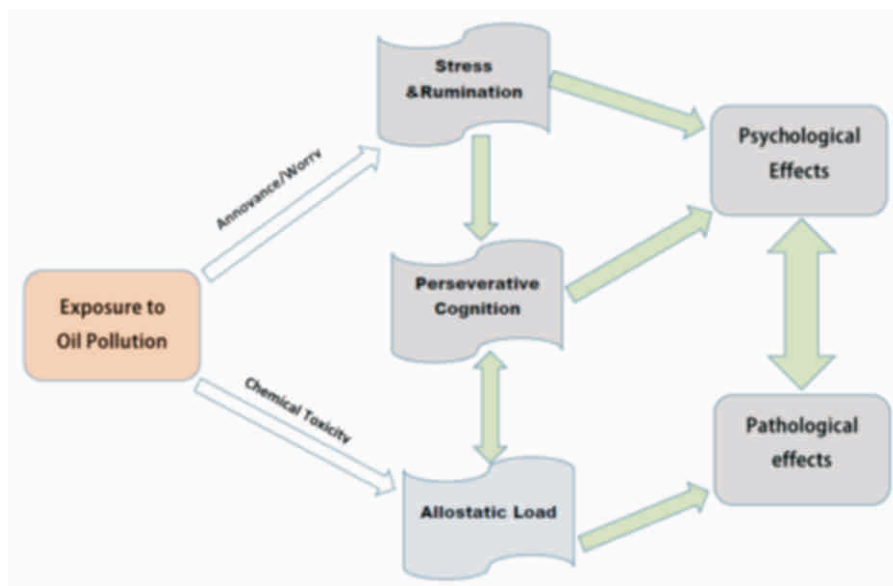


Figure 1: Schematic of key pathways in the development of psychological and pathological ill effects following exposure to oil pollution

References

- Adeola, F.O. (2000). Endangered community, enduring people: toxic contamination, health, and adaptive responses in a local context. *Environ Behav.* 32: 209–249.
- Aguilera, F., Méndez, J., Pásaroa, E., Laffon, B. (2010). Review on the effects of exposure to spilled oils on human health. *J. Appl. Toxicol.* 30: 291–301.
- Akinbobola, O.I., Njor, B.E. (2014). Environmental Worry of River State Residents in the Niger Delta Region, Nigeria. *Psychology* 5: 32-37.
- Axelsson, G., Stockfelt, L., Andersson, E., Gidlof-Gunnarsson, A., Sallsten, G., Barregard, L. (2013). Annoyance and worry in a petrochemical industrial area—prevalence, time trends and risk indicators. *Int. J. Environ. Res. Public Health* 10: 1418-1438.
- Beckie, T.M. (2012). A Systematic Review of Allostatic Load, Health, and Health Disparities. *Biological Research for Nursing* 14(4): 311-346.
- Bell, P. A., Greene, T. C., Fisher, J. D., Baum, A. (2001). *Environmental Psychology*. Orlando, FL: Harcourt.
- Brosschot, J.F., Gerin, T.W., Thayer, J.F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *J Psychosomatic Res* 60: 113–124.
- Campbell, J. (1983). Ambient stressors. *Environ Behavior*, 15: 355–380.
- Cutchin, M.P., Remmes, M.K., Owen, S.V., Goodwin, J.S. (2008). Concern about petrochemical health risk before and after a refinery explosion. *Risk Anal.* 28: 598–601.
- Denson, T.F. (2012). The multiple systems model of angry rumination. *Personality Social Psychol Review* 17: 103–123.
- Denson, T.F., Pedersen, W.C., Friese, M., Hahm, A., Roberts, L. (2011). Understanding impulsive aggression: Angry rumination and reduced self-control capacity are mechanisms underlying the provocation-aggression relationship. *Personality Social Psychol Bull.* 27: 850-862.
- Ehigie, B.O. (2005). Ethnic differences and perceived marginalisation as psychological issues of conflict in Nigeria. *Nigerian J Internat Affairs* 31: 71-89.
- Gay, J., Shepherd, O., Thyden, M., Whitman, M. (2014). *The Health Effects of Oil Contamination: A Compilation of Research*. Worcester Polytechnic Institute, Worcester, Massachusetts, USA. <https://sites.google.com/site/oilcontaminationhealtheffects/>, accessed, September 2014.
- Glei, D.A., Goldman, N., Wu, C.H., Weinstein, M. (2013). Does exposure to stressors predict changes in physiological dysregulation? *Ann Behav Med.* 46(1): 121–126.
- Goldstein, B.D., Osofsky, H.J., Lichtveld, M.Y. (2011). The Gulf oil spill. *N Engl J Med.* 364: 1334-1348.
- Lasser, K., Boyd, J.W., Woolhandler, S., Himmelstein, D.U., McCormick, D., Bor, D.H. (2000). Smoking and mental illness: A population-based prevalence study. *JAMA* 284: 2606–2610.
- Mattei, J., Demissie, S., Falcon, L. M., Ordovas, J. M., Tucker, K. (2010). Allostatic load is associated with chronic conditions in the Boston Puerto Rican Health Study. *Social Sci Med*, 70: 1988–1996.
- Nriagu, J.O., Udofia, E.A., Ekong, I., Ebuk, G. (2016). Health Risks Associated with Oil Pollution in the Niger Delta, Nigeria. *Int. J. Environ. Res. Public Health* 2016, 13: 346, 346 (e1-e23).
- Nwoke, M.B. (2011). Perception of the relationship between oil exploitation and environmental degradation in the Niger Delta, region: Psychological implications. *African J Psychol Study Social Issues*, 14.
- Ordinioha, B., Brisibe, S. (2013). The human health implications of crude oil spills in the Niger delta, Nigeria: An interpretation of published studies. *Nigerian Med J.* 54: 10-16.

