

▶ DIRECT FROM ATSDR

A Fresh Look at Stress and Resilience in Communities Affected by Environmental Contamination

Ben Gerhardstein, MPH
 Pamela G. Tucker, MD
 Jamie Rayman, MPH
 Christopher M. Reh, PhD
*Agency for Toxic Substances
 and Disease Registry*

Editor's Note: As part of our continued effort to highlight innovative approaches to improve the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the Agency for Toxic Substances and Disease Registry (ATSDR) at the Centers for Disease Control and Prevention (CDC). ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. The purpose of this column is to inform readers of ATSDR's activities and initiatives to better understand the relationship between exposure to hazardous substances in the environment, its impact on human health, and how to protect public health.

The conclusions of this column are those of the author(s) and do not necessarily represent the official position of ATSDR or CDC.

Ben Gerhardstein is an environmental health scientist with ATSDR's Region 9 office. Dr. Pamela Tucker is a medical officer at ATSDR. Jamie Rayman is a health educator and community involvement specialist in ATSDR's Region 9 office. Dr. Christopher Reh is the associate director for ATSDR.

From toxic waste in Love Canal, New York, to lead in Flint, Michigan, environmental contamination can cause chronically elevated psychosocial stress (see sidebar) in individuals and across families and communities (Cuthbertson, Newkirk, Loveridge, & Skidmore, 2016; Edelman, 2004; Levine, 1983). Stress is a normal reaction to environmental contamination, not a mental health disorder. Still, stress can affect people's health and quality of life.

Environmental contamination can cause psychosocial stress among affected community members for many reasons, including:

- **Uncertainty:** At the individual level, people might not know whether, at what level or for how long, they were exposed. Moreover, scientists and physicians might be

uncertain about the possible health effects of exposure.

- **Health and safety concerns:** At a family level, parents might worry about their children's health. They might feel their home is not a safe place anymore.
- **Social conflict:** At the community level, there can be discord between community members who have differing beliefs about the seriousness of the threat.

In addition, lengthy environmental and health investigations, loss of trust in institutions, financial strains, and other concerns associated with environmental contamination are sources of stress.

For affected community members, the stress of living with environmental contamination can pose physiological health risks on

top of risks associated with direct exposure to the contamination. Chronic stress has been linked with cardiovascular effects, increasing the risk for development of hypertension and plaque formation in atherosclerosis (Kaplan, Pettersson, Manuck, & Olsson, 1991; Melin, Lundberg, Söderlund, & Granqvist, 1999; Seeman et al., 2010). Stress can also trigger complex headaches (e.g., migraines) and flares in autoimmune (Stojanovich & Marisavljevic, 2008) and dermatological conditions (Arndt, Smith, & Tausk, 2008). Disadvantaged and vulnerable populations might also disproportionately suffer from other psychosocial and environmental stressors (e.g., institutionalized discrimination, adverse childhood events) (Collaborative on Health and the Environment, 2016; Morello-Frosch & Shenassa, 2006). Further, stress and chemical exposures can interact, producing worse health outcomes than either independently (McEwen & Tucker, 2011).

Conversely, individual and community resilience can promote physical and psychological health and enhance well-being. Community resilience is the ability of a community to adapt to changing conditions and prepare for, withstand, and rapidly recover from disruption (The White House, 2015). Communities able to develop an actionable plan to cope with and recover from a disaster tend to have better outcomes (Wulff, Donato, & Lurie, 2015). While acute disasters affect communities differently from chronic environmental contamination incidents (Table 1), resilience theory and principles can be applied to help communities prepare for, survive, and recover from natural and technological disasters (Sandifer & Walker, 2018).

The Agency for Toxic Substances and Disease Registry (ATSDR) and other federal,

TABLE 1

Acute Disasters and Chronic Contamination Affect Communities Differently

Acute Disasters (e.g., Hurricane, Terrorist Attack)	Chronic Contamination (e.g., Toxic Chemical in Drinking Water)
Have a before and after	Becomes a context of community life with no clear beginning and end
Immediate visible damage	Relatively invisible
Clear human health and safety impacts	Uncertain human health impacts
Promote action	Promote study of potential remedies
People cycle through stages of warning/threat/impact, response, recovery	Traps some people in warning/threat/impact stages without a clear path to recovery
Adapted from Couch and Coles (2011) and Sandifer and Walker (2018).	

state, and local health professionals with experience in communities affected by environmental contamination recognize stress as a challenge. ATSDR's efforts to address this issue date back to a 1995 expert panel on the psychological effects of hazardous substances (Agency for Toxic Substances and Disease Registry [ATSDR], 1995). Following the expert panel, ATSDR established a community stress team that worked directly with communities to develop public health strategies to mitigate community stress from 1998–2002. The team also delivered trainings on stress and contamination for public health and environmental professionals, and in some communities, for local psychologists, healthcare providers, and social workers.

More recently, public health agencies, including ATSDR, have developed stress-focused materials for affected community members. These materials acknowledge stress and worry related to environmental contamination, validate these feelings as normal responses, offer ideas for coping, and point to helpful resources (ATSDR, 2017a; County of Los Angeles Public Health, 2018; Multnomah County, 2016). ATSDR also developed tips for health professionals to review before addressing this topic with community members (ATSDR, 2017b) and has provided awareness-level training for public health and environmental professionals (U.S. Environmental Protection Agency, 2018). ATSDR's fact sheet (in English and Spanish) and tips sheet are available at www.atsdr.cdc.gov/factsheets.html under the Stress and Environmental Contamination section.

Currently, ATSDR is taking a fresh look at psychosocial stress related to environmental contamination, with a focus on per- and polyfluoroalkyl substances (PFAS) in drinking water. This community-engaged project might enhance knowledge and understanding of PFAS contamination-related stressors, informing new tools, resources, and strategies to reduce stress and build resilience in affected communities.

The project includes the following activities:

- **Review literature:** A systematic literature review on the intersection of chronic environmental contamination, psychosocial health, and community resilience will inform other activities and be presented in a peer-reviewed manuscript and an online webinar.
- **Understand community experiences:** We conducted nine key informant interviews with community leaders and state health officials to learn more about how communities experience and cope with PFAS contamination events. While not a nationally representative picture of community responses to PFAS contamination, the interviews helped put community voices at the center of the project.
- **Develop educational materials:** We will revise and develop new educational materials on environmental contamination, stress, and community resilience for health professionals and affected community members based on the literature review

and community experiences. The materials will be designed for and tested with health professionals and people living in PFAS-affected communities.

• **Develop a community stress resilience toolkit:** We will develop a toolkit for state and local health organizations with practical, evidence-based public health strategies for implementing stress resilience interventions in communities facing environmental contamination.

• **Convene stakeholder group:** A stakeholder group with community leaders, health professionals, disaster mental health experts, and others will provide input on toolkit content and implementation.

ATSDR looks forward to engaging community members and public health partner organizations in this work. Contact Ben Gerhardstein at bgerhardstein@cdc.gov to learn more. 🐼

What Is Psychosocial Stress?

Psychosocial stress is a term that combines “psychological stress” and “social stress.” Psychological stress refers to emotional, behavioral, biochemical, and physiological reactions that people experience when confronted with a situation that strains their ability to cope. Social stress refers to feelings that can arise from a person's relationship to others, including family, neighborhoods, and the workplace, that can lead to psychological stress. Each type of stress can influence the other. Taken together, the terms are called psychosocial stress.

Corresponding Author: Ben Gerhardstein, Environmental Health Scientist, Division of Community Health Investigations, Region 9, Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, 75 Hawthorne Street, Suite 9410, San Francisco, CA 94105.

E-mail: bgerhardstein@cdc.gov.

References

Agency for Toxic Substances and Disease Registry. (1995). *Psychological responses to hazardous substances: Report of the expert*

panel workshop. Retrieved from <https://www.atsdr.cdc.gov/risk/prhs/index.html>

Agency for Toxic Substances and Disease Registry. (2017a). *Coping with the stress that environmental contamination can cause*. Retrieved from <https://www.atsdr.cdc.gov/docs/factsheet/ATSDR-Stress-Fact-Sheet.pdf>

Agency for Toxic Substances and Disease Registry. (2017b). *Tips on using the “coping with stress” fact sheet for ATSDR & health department staff*. Retrieved from https://www.atsdr.cdc.gov/docs/factsheet/Stress_Tips_Fact_Sheet-508.pdf

Arndt, J., Smith, N., & Tausk, F. (2008). Stress and atopic dermatitis. *Current Allergy and Asthma Reports*, 8(4), 312–317.

Collaborative on Health and the Environment. (2016). *Psychosocial environment*. Retrieved from <https://www.healthandenvironment.org/environmental-health/environmental-risks/psychosocial-environment>

Couch, S.R., & Coles, C.J. (2011). Community stress, psychosocial hazards, and EPA decision-making in communities impacted by chronic technological disasters. *American Journal of Public Health*, 101(Suppl. 1), S140–S148.

County of Los Angeles Public Health. (2018). *Community health outreach: Let's talk about Exide*. Retrieved from <http://publichealth.lacounty.gov/eh/exide/>

Cuthbertson, C.A., Newkirk, C., Ilardo, J., Loveridge, S., & Skidmore, M. (2016). Angry, scared, and unsure: Mental health consequences of contaminated water in

Flint, Michigan. *Journal of Urban Health*, 93(6), 899–908.

Edelstein, M.R. (2004). *Contaminated communities: Coping with residential toxic exposure* (2nd ed.). Boulder, CO: Westview Press.

Kaplan, J.R., Pettersson, K., Manuck, S.B., & Olsson, G. (1991). Role of sympathoadrenal medullary activation in the initiation and progression of atherosclerosis. *Circulation*, 84(Suppl. 6), VI23–VI32.

Levine, A. (1983). Psychosocial impact of toxic chemical waste dumps. *Environmental Health Perspectives*, 48, 15–17.

McEwen, B.S., & Tucker, P. (2011). Critical biological pathways for chronic psychosocial stress and research opportunities to advance the consideration of stress in chemical risk assessment. *American Journal of Public Health*, 101(Suppl. 1), S131–S139.

Melin, B., Lundberg, U., Söderlund, J., & Granqvist, M. (1999). Psychological and physiological stress reactions of male and female assembly workers: A comparison between two different forms of work organization. *Journal of Organizational Behavior*, 20(1), 47–61.

Morello-Frosch, R., & Shenassa, E.D. (2006). The environmental “riskscape” and social inequality: Implications for explaining maternal and child health disparities. *Environmental Health Perspectives*, 114(8), 1150–1153.

Multnomah County. (2016). *Stress and worry: A normal response to potential environ-*

mental exposures. Retrieved from <https://multco.us/lead-testing-were-here-help-0/news/stress-and-worry-normal-response-potential-environmental-0>

Sandifer, P.A., & Walker, A.H. (2018). Enhancing disaster resilience by reducing stress-associated health impacts. *Frontiers in Public Health*, 6, 373.

Seeman, T., Gruenewald, T., Karlamangla, A., Sidney, S., Liu, K., McEwan, B., & Schwartz, J. (2010). Modeling multi-system biological risk in young adults: The Coronary Artery Risk Development in Young Adults Study (CARDIA). *American Journal of Human Biology*, 22(4), 463–472.

Stojanovich, L., & Marisavljevic, D. (2008). Stress as a trigger of autoimmune disease. *Autoimmunity Reviews*, 7(3), 209–213.

U.S. Environmental Protection Agency. (2018). *NARPM presents... Stress and environmental contamination: Tips and tools from ATSDR*. Retrieved from <https://clu-in.org/conf/tio/NARPMPresents41/>

The White House, Office of the Press Secretary. (2015, March 19). *Executive order—Planning for federal sustainability in the next decade*. Retrieved from <https://obama.whitehouse.archives.gov/the-press-office/2015/03/19/executive-order-planning-federal-sustainability-next-decade>

Wulff, K., Donato, D., & Lurie, N. (2015). What is health resilience and how can we build it? *Annual Review of Public Health*, 36(1), 361–374.



Employers increasingly require a professional credential to verify that you are qualified and trained to perform your job duties. Credentials improve the visibility and credibility of our profession and they can result in raises or promotions for the holder. For 80 years, NEHA has fostered dedication, competency, and capability through professional credentialing. We provide a path to those who want to challenge themselves and keep learning every day. Earning a credential is a personal commitment to excellence and achievement.

Learn more at neha.org/professional-development/credentials.



A credential today can improve all your tomorrows.

