3 Keys for Addressing Community Stress in Environmental Contamination

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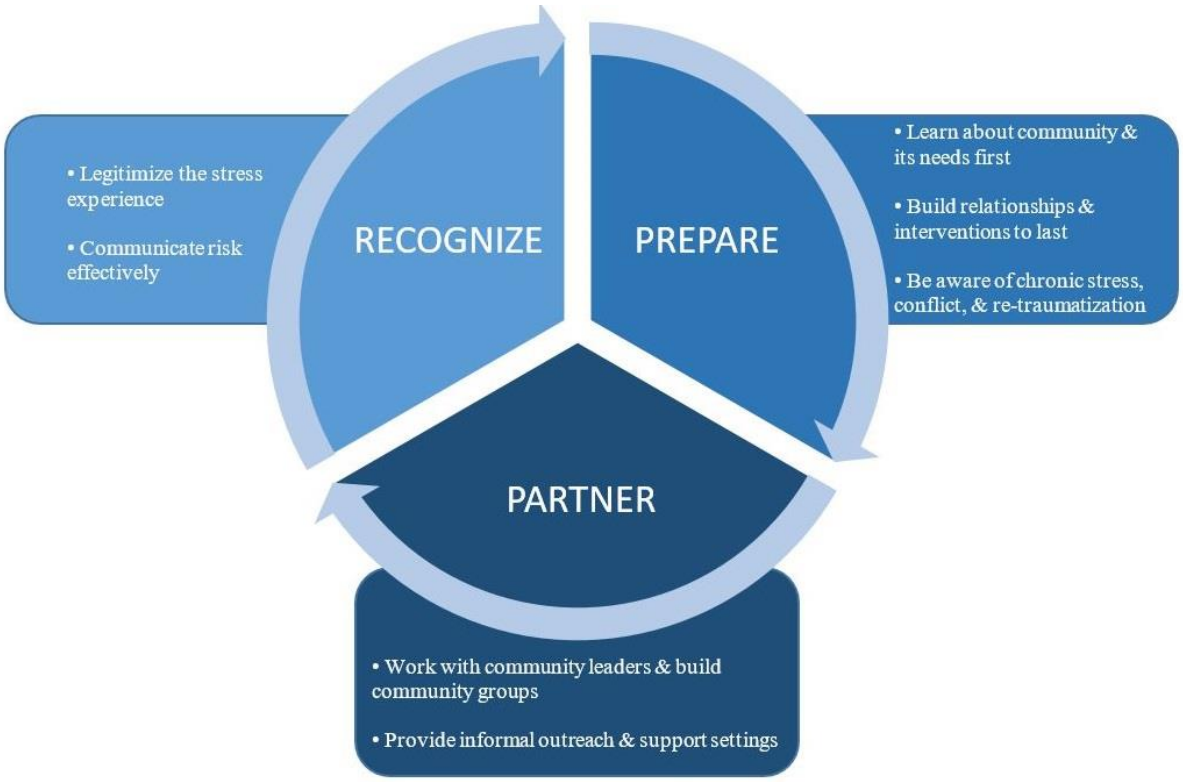
The experience of long-term exposure to chronic environmental contamination (CEC) can be psychologically stressful for some members of an affected community. Chronic stress can have a variety of deleterious physical health effects. Further, stress and its associated health effects may interact further with toxicant exposure to weaken already vulnerable populations. Addressing the psychosocial impacts in communities living with CEC is therefore important for improving their health and resilience (Edelstein, 2004; Hoover et al., 2015).

The recommendations in this report are intended especially for public health officials or local leaders aiming to intervene to increase community resilience in CEC-impacted communities while taking psychosocial impacts into account. A recent review of the literature on psychosocial impacts of CEC conducted as part of the ATSDR Community Stress and Resilience Project (Sullivan et al., under review) reaffirms that one of the major common stressors in this context is a loss of trust in institutions previously believed to be socially protective. Even more specifically, it is clear that the actions of public health professionals have the potential to directly or indirectly elevate stress in community members undergoing this experience. When intervening representatives of responsible institutions act in ways that acknowledge the legitimacy of the stress response and work to re-build community trust, this can be a crucial step in developing community resilience through the strengthening of social capital.

The present report builds on the findings of the project literature review by outlining a list of primary and secondary objectives for intervening to increase resilience in a contamination-impacted community in ways that are sensitive to psychosocial issues. We refer to this approach broadly as the **3 Keys for Addressing Community Stress in Environmental Contamination**, to highlight the three main objectives to **Recognize, Prepare,** and **Partner.** The approach is presented schematically in the figure on the following page. The cyclical nature of this image attests to the fact that 3 Keys are part of an iterative process. Chronic contamination can impact a community for decades and across generations. If at all possible, local public health professionals seeking to intervene in such contexts need to prepare for a "long road" of partnering with the community to gradually build psychosocial and other forms of resilience.

Roughly speaking, the objectives to **Recognize, Prepare,** and **Partner** build in intensity and complexity, with **Recognizing** being the most basic level an intervening professional should hope to achieve, and **Partnering** being a more demanding, long-term process. Each of these objectives can be adopted independently, but they function best when employed simultaneously and iteratively. They should not be adopted in any rigid way, but rather adapted to meet the needs and goals of a particular community in a particular situation. This report interweaves a discussion of the strategies with recommendations about particular resources available to enact these objectives. These resources will be available in ATSDR's Community Stress Toolkit.



RECOGNIZE

Main Objective: **It is important to understand that all public efforts become part of the community's "secondary impact" experience, and to prevent negative secondary impacts. This can be done by continually evaluating how public health actions are either helping or hindering community engagement and resilience efforts by either reducing or elevating psychosocial impacts, and improving actions accordingly.**

When intervening to assist communities impacted by CEC, it is imperative to remember that all actions (and inactions) become part of the community's "secondary impact" experience, for better or for worse (Becker, 1997). A primary risk pathway for stress in the CEC context is the (repeated) experience of *institutional delegitimization*: feeling that responsible or socially protective institutions have denied or misattributed one's concerns about CEC-related health effects (Sullivan et al., under review). There are three primary processes through which institutional delegitimization may occur (Vyner, 1988):

(1) Denial (or framing as a "non-issue"; Reich, 1991) of the severity and potential impact of CEC by corporations, government, or public health officials

(2) Problematic relationships with healthcare providers who are unfamiliar with CEC and may attribute patient concerns to hypochondria (what Vyner, 1988, called "dysfunctional medical relationships")

(3) Indirect or direct victim-blaming processes (e.g., attributing health effects to resident "lifestyles" as opposed to CEC)

Public health officials and other representatives of intervening institutions should always bear in mind their power to either de-legitimate or legitimate the community's experience. Institutional delegitimization can be minimized if professionals interacting with the community take efforts to *legitimize the stress experience* and *communicate risk effectively*.

Secondary Objective: **Legitimize the Stress Experience.** Particularly when it comes to building psychosocial resilience, a key tactic from the disaster mental health relief approach is to validate the stress experience as normative, reducing the likelihood of stigmatization (Ellis et al., 1992; Hernandez & Sedler, 2003). In other words, the idea should be communicated that stress is a *normal* response to the *abnormal* situation of finding oneself exposed to CEC. One of the implications of this approach is that public health professionals should not consider it their job to "diagnose" or treat individuals for mental health conditions, although it may be advisable to educate local mental health professionals about the unique aspects of CEC.

The disaster mental health relief approach also means, critically, expressing to the community that the *source* of their stress needs to be dealt with first and foremost. Public health professionals and other community leaders or professionals should be doing all they can to support efforts to reduce community exposure, prevent further contamination, remediate existing contamination, and address irreversible health effects from earlier exposures. However, the fact that reducing or undoing contamination, and addressing its physical health effects, is the top priority does *not* mean that addressing and mitigating stress in this context is not also important. Public health professionals should make efforts to not only prevent additional stress from occurring, but to also educate the community regarding the normality and consequences of stress in the CEC context. Importantly, legitimizing stress involves not only public education, but also outreach efforts to other involved parties (e.g., other public health professionals, EPA staff, primary care physicians and therapists) concerning the normative nature of this stress.

Related Resources: The first step in legitimizing the stress experience is to become educated concerning the nature of stress and its effects. While this is a vast topic, several webinars and presentations have been prepared as part of the early efforts of ATSDR's Community Stress Team, and the ongoing efforts of the ATSDR Community Stress and Resilience Project. These resources are useful because they discuss stress specifically in the context of CEC. When it comes to communicating about and legitimizing stress for the public, there are several available fact sheets that are helpful, notably ATSDR's (2017) "Coping with the Stress that Environmental Contamination Can Cause", which focuses on CEC-related stress; but more general fact sheets on stress and trauma are available from SAMHSA, NIMH, and the National Child Trauma Stress Network, often tailored to specific community audiences or to a broad disaster context. Such fact sheets should be used responsively when community members express interest in learning about or dealing with stress and mental health conditions related to CEC; they should not be "pushed" on to individuals, especially not when those individuals are expressing anger or frustration. For scholarly literature, the ATSDR Community Stress and Resilience Project literature review (Sullivan et al., under review) provides a comprehensive overview of recent research on CEC-induced stress. An article by Ellis et al. (1992) entitled, "Environmentally Contaminated Families: Therapeutic Considerations" provides an overview for mental health professionals of the unique issues they may need to consider when addressing stress in CEC-impacted communities.

Secondary Objective: **Communicate Risk Effectively.** All intervening individuals speaking in public settings must be familiar with basic principles of effective risk communication (e.g., the CDC's Crisis and Emergency Risk Communication approach), as well as the importance of cultural sensitivity in this domain (Lindell & Perry, 2004; Ramirez-Andreotta et al., 2014). Utmost caution should be practiced to avoid any language that might inadvertently convey victim-blaming (e.g., comparing involuntary to voluntary risks, such as the risk of exposure through contaminated drinking water to that of exposure through fast food consumption; Mullen, 1989). CEC-impacted community members are also often sensitive to delegitimization through apparent denial of the seriousness of risks, which can sometimes take the seemingly innocuous form of "putting numbers in context" (e.g., comparing the average community member's exposure to PFAS through their water to "one drop in an Olympic-sized swimming pool").

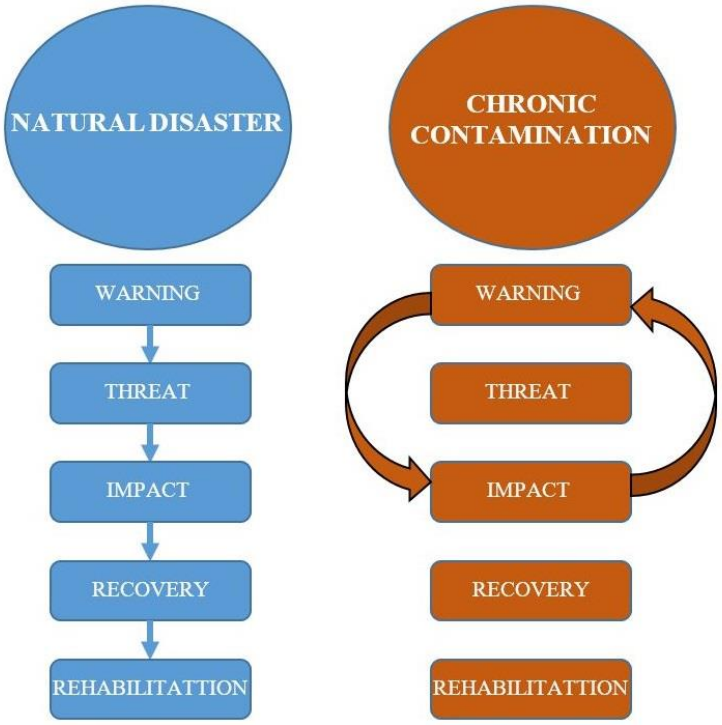
A further complicating factor is the reality that scientific uncertainty produces its own form of stress (Freudenburg, 1993); the chronic stress brought about by potential exposure to emerging contaminants of concern often centers around the absence of maximum contaminant levels, government policy, or official recommendations. Recent research (Brody et al., 2007; Hoover et al., 2015) suggests that community members are willing to accept scientific uncertainty, provided that they sense transparency in communication and believe that efforts are underway to answer important questions. Community members are also impacted by their relationships with healthcare providers (which can be either inadvertently stressful or deliberately reassuring), underscoring the importance of educating general practitioners and other providers about the history and scope of CEC in an area.

Related Resources: Official manuals exist for risk communication by public health professionals, emergency managers, and others, notably CDC's "CERC" Manual (2018) and ATSDR's "Public Health Assessment Guidance Manual" (2005). The "Environmental Health Project Medical Toolbox" (2016), developed by the Southwest Pennsylvania Environmental Health Project, provides a variety of resources and instructions for medical practitioners who want to take environmental exposure histories into account when working with their patients. For scholarly literature, although this is a very large area of research, Covello's (2003) concise "Best Practices" article is a good starting point.

PREPARE

Main Objective: **It is important to understand the unique ways in which CEC has impacted and continues to impact this particular community. This can be done by planning for the unique timecourse of CEC, including gathering information about and assessing resources in the community, as well as learning about the unique nature of CEC-related stress and how to intervene in this context.**

While the stress, resilience, and community intervention scientific literatures have focused on acute community crises, public health professionals and others intervening in CEC-impacted communities need to understand – and communicate to the public – that they are dealing with a situation of chronic, potentially intergenerational stress. One of the main ways in which CEC generally differs from natural disaster experience is in its unique timecourse. Social reactions to natural disasters tend to follow a fairly predictable sequence, and research suggests that many individuals are psychologically recovered from the experience of natural disaster in about one year (Bonanno et al., 2010). However, the CEC experience may last decades, with individuals being caught in "repeat" cycles (see Figure) and ongoing stress experiences as more people learn about local contamination, as remediation efforts become prolonged, as new contaminants of concern are identified, or as (attributed) long-term health effects emerge.



Note. Figure adapted from Couch & Coles (2011).

One implication is that many materials prepared to increase psychosocial resilience are designed for the timecourse of an acute natural disaster or potentially traumatic event, and may need to be modified for use in the CEC context. Although it is difficult to formulate general rules as to how this may be done, the first step is to achieve an understanding of the nature of chronic stress and the unique timecourse of CEC. By learning about these factors, public health

professionals will be better able to adapt available materials for this context. To provide only a few examples, consider the CDC fact sheet "Coping with a Disaster or Traumatic Event" (2018), and the SAMHSA fact sheet "Tips for Talking with and Helping Children and Youth Cope after a Disaster or Traumatic Event" (n.d.). Some of the information in these fact sheets will apply to both CEC and more acute events; for instance, warning signs of excessive stress in individuals may be similar across situations. Other pieces of information, however, may be less applicable to CEC; for instance, assurances that "Most of the time [children] get back to feeling okay soon after a trauma" may be less accurate in a chronic stress context; and advice to "Limit exposure to media and social media coverage of the event" may be misguided in an ongoing CEC episode where media could be an important source of current information.

An important caveat is that contamination is in many instances caused by a technological disaster (such as a train crash leading to a chemical spill). In such situations, public health professionals may need to carefully observe the community, and learn about the precipitating event, in order to formulate a psychosocially sensitive intervention that is either more like a natural disaster or more like a CEC intervention. Especially in cases where there is substantial loss of life caused by the triggering event, or many individuals experiencing fear for their lives at the time of this event, the course of psychosocial reaction may be more similar to cases of acute trauma (e.g., there may be more post-traumatic stress symptoms reported, or even individuals suffering from PTSD, and more direct mental health treatment may be necessary). Similarly, cases where mass community relocation occurs are accompanied by their own unique set of stressors; ATSDR's fact sheet "Helping Families Deal with the Stress of Relocation After a Disaster" (2005) is a helpful starting place for dealing with this issue.

Secondary Objective: **Learn about the Community and its Needs First.** Prior to conducting any intensive work, it is important to assess the community in basic ways, including understanding how people in the community receive health information and important centers of cohesion or support (e.g., leaders, prominent organizations, and resources such as church halls, public centers, and extant mental health or disaster relief services). Traditional media and social media are typically important sources and factors in shaping a community's awareness of and attitude towards CEC (Aronoff & Gunter, 1992; Mazur, 1989). Communities and parties within communities vary widely in terms of which sources of information they trust; sometimes local media are trusted more than public health departments or responsible contaminating parties, sometimes public health departments are trusted more, and sometimes either local media or public health departments can be seen as "in league with" responsible parties and hence distrusted (McComas & Trumbo, 2001). Regional and cultural differences often play a role in who is seen as primarily responsible for the physical and mental health of the community; in some settings, this may be the role of professionals such as clinicians and social workers, but in other settings, clergy may play an equal or more important part.

The ATSDR Community Stress Team took as an important first step of its intervention work conducting a needs assessment with a psychosocial focus. This meant, in part, determining whether or not the community had any interest in ameliorating stress caused by contamination. This is a very important step in a psychosocially sensitive intervention, because the psychological issues surrounding contamination can be divisive or controversial, and different communities (and different parties within communities) may have different ideas about whether

problematic stress exists and whether it is a problem that should be discussed and dealt with openly. Some communities may be resistant to the idea of addressing stress, in which case a stress intervention may be harmful (Ellis et al., 1992). Only when a substantial proportion of community members acknowledge stress as an issue that they would like to see addressed should public health officials intervene in ways that specifically target stress. Much of the information and recommendations in this report can be used more subtly to prevent negative secondary impacts in any kind of CEC community intervention, even if stress is not on the table as a target.

Related Resources: ATSDR's "Principles of Community Engagement" (2011) manual provides general guidance on how to undertake an assessment of community needs as well as resources that can be leveraged. CDC's "Community Assessment for Public Health Emergency Reponse (CASPER)" (2019) toolkit offer comprehensive, actionable guidance on how to rapidly attain and disseminate cross-sectional, household-level data in emergencies such as a mass contamination event. The ATSDR Community Stress Team "Logic Model and Instrument Potential Questions" (n.d.) checklist provides a detailed list of items to cover in needs and outcome assessment efforts when specifically targeting psychosocial impacts of CEC, differentiating between assessments of immediate needs and capacities as well as intermediate and long term outcomes. CDC's "Planning for an Emergency: Strategies for Identifying and Engaging at-risk Groups" (2015) manual, although primarily designed for emergency managers anticipating acute crises, offers generally applicable guidance on how to locate and engage with at-risk groups that may also need to be reached in a CEC situation, particularly if precipitated by technological disaster. For scholarly literature, a report of the CASPER that was performed during the Flint, Michigan 2016 water crisis is available in Fortenberry et al. (2018).

Secondary Objective: **Build Relationships and Interventions to Last.** Public health officials should build interventions "to last." Doing so requires partnering with communities to build mechanisms and resources for the ongoing provision of services such as informational or mental health support, even in the absence of oversight by initially intervening public health professionals. In general, relationships should be cultivated and maintained with community leaders and local professionals before and after concrete intervention efforts, to facilitate possible (re-)intervention in the event of later developments in the community.

The ATSDR Community Stress Team's work in Libby, MT provides a good example of how to achieve this secondary objective. For decades, a vermiculite mine and processing plants operated in this rural town, exposing miners and plant workers, as well as residents and families, to amphibole asbestos (Cline et al., 2014). As part of the federal government's public health response, the ATSDR Community Stress Team and EPA's Community Involvement Coordinators intervened in the Libby community with the express aim of addressing psychosocial needs. This intervention included first discussing the possibility of addressing psychosocial stressors with the local Community Advisory Group and conducting a community needs assessment focused on psychosocial issues, prior to implementing multiple actions (including outreach efforts and the formation of support groups). Importantly, ATSDR and EPA also supported the efforts of local social workers and University of Montana researchers, who were able to continue to provide psychosocial and other support to the community after the Community Stress Team concluded formal operations. The efforts of these local professionals resulted in an ongoing program of community-based participatory research (Kuntz et al., 2018).

Related Resources: The single most-comprehensive resource for intervening in CEC-impacted communities in a way that prepares for their unique features is the manual that resulted from efforts in Libby, MT. Written by local social workers, the manual entitled "Addressing the Psychosocial Elements of Slow Motion Technological Disasters" (Hernandez & Sedler, 2003) describes in detail the unique timecourse of CEC, how it presents unique barriers to effective resilience interventions, and how intervention efforts can be "built to last" by mobilizing local resources and informal outreach and support settings. For scholarly literature, an article by Ramirez-Andreotta et al. (2014) entitled "Environmental Research Translation" overviews approaches to building ongoing community participation into research translation efforts.

Secondary Objective: **Be Aware of Chronic Stress, Conflict, and Re-traumatization.** Interventions to increase community resilience are unlikely to succeed unless public health professionals or other intervening individuals understand and engage the community with an understanding of the likely unique psychosocial impact of CEC. Chronic stress has unique aspects that should be understood by public health professionals: for example, depressive symptoms in chronic stress are more likely to take the form of fatigue and hypersomnia (e.g., Keller, Neale, & Kendler, 2007; Schetter & Dolbier, 2011). Disadvantaged group members most likely to be affected by CEC often suffer chronic stress for a variety of additional reasons (Morello-Frosch & Shenassa, 2006). Although therapy may not be necessary or appropriate for the majority of CEC-impacted individuals, certain therapeutic approaches such as Acceptance and Commitment Therapy (ACT) have shown promise in a case study of a patient impacted by CEC (Jourdain & Dulin, 2009), and these could be recommended to or discussed with local mental health professionals. Community conflict over how to define and respond to contamination (e.g., to relocate the community or not) can be a major "secondary" stressor that is relatively unique to the CEC context, as well as other long-term stressors such as litigation-related stress, concerns about job security, stigmatization due to perceived contamination, and portrayal of one's community in the media (Couch & Coles, 2011). Finally, intervening individuals should remain sensitive to the possibility of re-traumatization among affected community members, either as they experience (attributed) health effects or as new contaminating incidents occur or contaminants are revealed.

Related Resources. Several training sessions for public health professionals focused on the unique aspects of stress in CEC prepared by ATSDR will be available as part of ATSDR's Community Stress and Resilience Toolkit. SAMHSA's fact sheet "Cultural Awareness when Working in Indian Country Post-Disaster" and the National Child Trauma Stress Network's fact sheet "Complex Trauma: In Urban African-American Children, Youth, and Families" (2017) summarize special considerations for working with disadvantaged groups. SAMHSA's fact sheet "Tips for Survivors of a Disaster or Other Traumatic Event: Coping with Retraumatization", although designed for acute traumatic events, may also be useful for helping community members deal with possible re-traumatization in the CEC context. For scholarly literature, good introductions to the unique stress timecourse in CEC are available in Couch and Coles' article "Community Stress…in Communities Impacted by Chronic Technological Disasters" (2011) and in Meluch et al.'s chapter "Intractable Conflict in a Slowly-Evolving Environmental Disaster" (2016). Marshall et al.'s article "Technological Disasters, Litigation Stress, and the Use of Alternative Dispute Resolution Mechanisms" (2004) details stressful legal issues and solutions.

PARTNER

Main Objective: **It is important to engage with the community to assess needs and develop, implement, and maintain long-term interventions and resilience mechanisms. This can be done by enabling community ownership of collaborative solutions, leveraging existing strengths while listening to and investing in the community's needs.**

If community members are interested in confronting the issue of CEC and its psychosocial consequences, then they should be empowered as much as possible to collaborate in intervention efforts and inform environmental risk management decisions (Ramirez-Andreotta et al., 2014). Such empowerment efforts are vital for at least two reasons: (1) given the long-lasting nature of most CEC, community leadership groups and local service providers will necessarily be required to sustain resilience-building activities after initial intervention procedures and formal operations of government agencies have subsided (Hernandez & Sedler, 2003); and (2) environmental and community advocacy in the CEC context can restore a threatened sense of agency in community members and thereby facilitate recovery from negative psychological effects (Stone & Levine, 1985).

The "resilience" approach of recent decades results from scientific and governmental initiatives to shift efforts from rapid governmental *response* to disasters and crises toward enhancing community *preparedness* to weather such events in a resilient fashion. Although many frameworks and tools for community resilience were designed for acute crises, the new focus on mobilizing and building social capital means they are often also relevant to CEC.

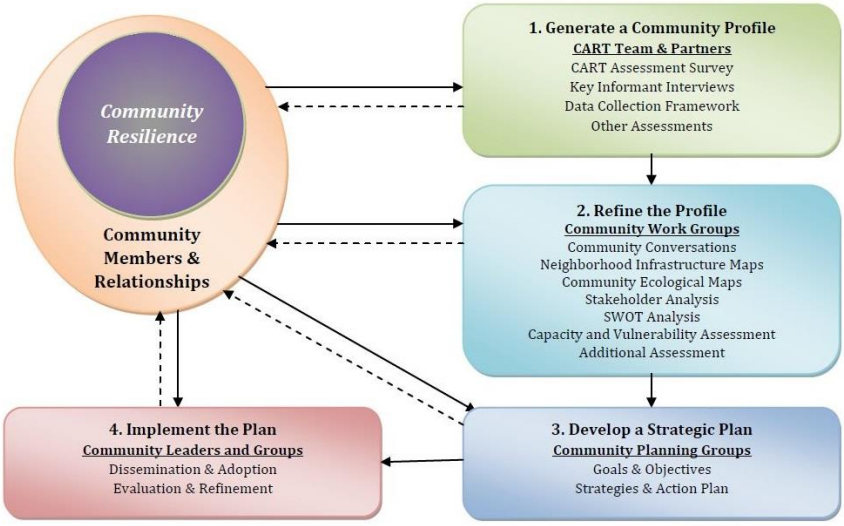
Traditional Disaster Preparedness Approach Focuses On:	Community Resilience Approach Focuses On:
Individual households and their readiness to respond to emergencies	**Community members working together** to respond to and recover from emergencies
Disaster-specific functions (e.g., earthquake building codes, training staff to provide first aid)	Merging of other community efforts that build **social, economic, and health well-being**
Government's response in the first few days and weeks after a disaster	**Diverse network of government and nongovernmental organizations** in preparing for, responding to and recovering from disaster
Emergency plans and supplies only	**Collaboration and engagement** of the whole of community for problem-solving
Self-sufficient **individuals or households**	Self-sufficient community through **neighbor-to-neighbor connections and strong social networks**

Note. Figure reproduced from www.laresilience.org, and from Uscher-Pines, Chandra, & Acosta (2013).

Given that communities impacted by CEC are disproportionately likely to have high proportions of racial/ethnic minority or lower-income residents, there may be a lack of extant forms of social capital. Nevertheless, interventions are unlikely to succeed unless sources of potential bonding social capital are identified and mobilized. Furthermore, bridging social capital between community members and other important parties (e.g., state and local governments) must be built and often "repaired" after CEC-impacted residents have experienced a sense of betrayal or loss of trust in socially protective institutions.

Secondary Objective: **Work with Community Leaders and Build Community Groups.** Comparative case studies have shown that communities with stronger social ties and attachment to place are more resilient in the face of CEC (Fuller, 2011), speaking to the importance of working with and strengthening sources of bonding social capital. Identifying and leveraging local assets and resources can be essential in building resilience to CEC, especially when it comes to securing requisite funding (Rogge, 1998). These resources can include human capital (leaders); networking capital (prominent civic/non-profit organizations); and other resources such as church halls, public centers, and extant mental health or disaster relief services.

Related Resources: ATSDR's "Principles of Community Engagement" (2011) manual offers extensive guidance and discusses relevant case studies for community engagement. NCEH's "Protocol for Assessing Community Excellence in Environmental Health (PACE EH)" (2000) manual provides a step-by-step framework for assessing community environmental health needs to develop an intervention addressing those needs. In the area of building community resilience more broadly, some toolkits like the "Resilience Builder" framework developed by the Los Angeles County Dept. of Public Health are still undergoing empirical validation. One of the most comprehensive frameworks is the "Communities Advancing Resilience Toolkit (CART)" developed by the Terrorism and Disaster Center at the University of Oklahoma (e.g., Pfefferbaum et al., 2013). The CART shares with other community resilience intervention approaches an iterative structure that combines performing community assessments with the formation of stakeholder groups and community meetings, resulting in ongoing implementation and evaluation efforts. The CART process is broadly representative of resilience interventions:



Note. Figure reproduced from Pfefferbaum, Pfefferbaum, & van Horn (2011).

Although it does not provide a formulated sequential framework or set of assessment tools, the manual "Addressing the Psychosocial Elements of Slow Motion Technological Disasters" (Hernandez & Sedler, 2003) is the most comprehensive single resource detailing tactics for working with communities and mobilizing local resources specifically in the context of CEC.

Secondary Objective: **Provide Informal Outreach and Support Settings.** Another key way to involve community leadership groups is by working with them to establish informal outreach and support settings and resources, which case studies show can be far more effective than formalized public meetings overseen by agency representatives. For instance, health fairs or "teach-ins" in prominent public locations can further health educational goals; and support groups have addressed mental health and informational needs in the CEC context. When the ATSDR Community Stress Team intervened in Libby, MT, they conducted outreach efforts to legitimize the stress experience through local radio messages, organized a health fair to address concerns about asbestos-related diseases, and created community-led medical support groups to offer informational and social support to individuals with diagnoses.

Related Resources: Descriptions of how to establish and employ informal outreach and support settings, accompanied by examples from the case of asbestos contamination in Libby, MT, are provided in the manual "Addressing the Psychosocial Elements of Slow Motion Technological Disasters" (Hernandez & Sedler, 2003).

Initial Recommendations from Key Informant Interviews

Beyond conducting a review of the relevant published and grey literature, the ATSDR Community Stress and Resilience Project has also conducted a series of interviews with key informants that contributes to the present approach. The following brief summary and recommendations are from interviews conducted with community leaders (n=6) and state health department staff members (n=3) in areas affected by per- and polyfluoroalkyl substances (PFAS) contamination. All interviews were conducted from July to September 2019. The purpose of these interviews was to inform the development of communications materials and public health response with stress in mind. Many common themes emerged across the interviews related to community members' contamination experiences, stressors, and advice for risk communication and public health response. These findings represent the perspectives of six community leaders and three state public health department representatives. Given the narrow perspective and small sample size, extrapolation from these findings should be made with caution. Nevertheless, the preliminary findings provide an important contextualization of the more abstract principles and strategies alluded to in the 3 Keys approach.

The PFAS contamination experience was reported to cause psychosocial stress due to a number of stressors. The reported stressors most relevant to interactions with public health departments and other similar governmental agencies were uncertainty and fear surrounding PFAS health risks, perceived dismissiveness of community members' fears, and loss of community trust in governmental entities.

Interviewees emphasized that the limited information available about PFAS was a source of much of their initial anxiety and fear. Interviewees reported wanting information for lay audiences on basic facts about PFAS, health risks, safe levels, interpreting testing results, actions to reduce exposure, and treatments for related health issues. Providing as much credible information as possible shortly after the discovery of PFAS contamination may help reduce stress related to uncertainty. One community member interviewee summed this point up as, "When you have knowledge, you become less fearful." Also, interviewees reported understanding that a lot is unknown about PFAS, and government agencies should admit when they do not know certain pieces of information, but also indicate what they are doing to collect more information and follow-up. In-person community forums and website/social media were the most commonly discussed information dissemination approaches utilized. However, these modes do not reach everyone, and interviewees highlighted the importance of an inclusive and broad communication approach that considers the needs of various "hard-to-reach" audiences such as those that do not speak English, the home-bound elderly, and low-income populations that may have less schedule-flexibility to attend meetings.

When interacting with public health departments and other similar governmental agencies, many interviewees explained that their fears were largely dismissed or diminished, at least initially. The state and local governments that reportedly minimized the risk of PFAS contamination characterized exposures as low health risk, and they leaned on a lack of evidence of adverse effects to support their position. Interviewees, however, advocated for a straightforward approach to communication that included validating and empathizing with community members, acknowledging the potential for health risks (even if the science is not

settled), providing information on actions governmental agencies are taking to address the situation, and providing community members tangible actions (e.g., strategies to reduce exposure, relevant health advice, forming community advocacy groups, etc.). One interviewee described their experience interacting with local health department personnel that attempted to minimize community concern, "[Local health department personnel] start out [by saying]… 'They measure parts per trillion. That's one drop in an Olympic-sized swimming pool that you're drinking. I mean how bad can that be?' …I think they think they're being reassuring to people and I think what people feel like is that's being dismissive of their fears."

Interviewees also mentioned the delicate way in which they suggested discussing the issue of psychosocial stress with community members. Interviewees warned that this could easily be interpreted as "victim blaming" or dismissive – that government agencies believe they are "just stressed" or "over-reacting." To reduce the chance of this, interviewees advised government agencies should discuss psychosocial stress only after having empathized, established trust, and validated the community members' physical health concerns. In short, first establishing trust, and only then framing psychosocial stress within the context of other health concerns.

Another theme from the interviews was a loss of trust among community members for governmental agencies that were previously viewed as "protectors," such as state and local health departments. This loss of trust was reportedly exacerbated when governmental officials made implausible claims such as saying the water is "safe" or that everything is "fine." One interviewee described their experiences reading a congressperson's account of the contamination, "She said in multiple newspapers...that the people who focus on this water contamination spread hysteria and bring down property values. So that adds another layer of distrust of the government entity." Interviewees advised government agencies should instead be straightforward, honest, transparent, and accessible – doing so on a long-term timeline, rather than just initially. Further, a state health department interviewee advocated for the formation of community-government working groups to determine solutions and for governments to be in frequent communication with community members and be very visible about the actions they are taking to address the situation.

While there are unavoidable sources of stress in this situation, positive interactions between community members and government, or other parties (e.g., healthcare providers), during this time may help reduce stress and allow communities to begin to foster stress resilience. When engaging community members, government agencies should empathize with and validate community members' experiences, understand stress and ways advice can be misinterpreted, offer practical actions (e.g., ways to reduce exposure), demonstrate partnership (e.g., repeated/ongoing contact), be visible, straightforward, and scientifically accurate. Further, environmental justice implications should be considered such as ensuring hard to reach groups receive information that they can understand, and ensuring advice on community actions is feasible for low socioeconomic status groups.

GLOSSARY OF KEY TERMS

Term	Definition	Scholarly References
Bridging Social Capital	• Resources and ties connecting community leaders and groups to larger, distal resources such as wealth, media mobilization, and state/federal government assistance	**Aldrich, D. P. (2012).** *Building resilience: Social capital in post-disaster recovery.* Chicago: University of Chicago Press.
Bonding Social Capital	• Local community resources such as social cohesion, strong ties between neighbors and groups, and neighborhood social control	**Aldrich, D. P. (2012).** *Building resilience: Social capital in post-disaster recovery.* Chicago: University of Chicago Press.
Chronic Environmental Contamination (CEC)	• The experience of living in an area where hazardous substances are known to be present in air, water, or soil at elevated levels • This contamination may be chemical or radiological, the result of prior/current industrial processes or a technological accident	**Edelstein, M. (2004).** *Contaminated communities.* Boulder, CO: Westview Press.
Chronic Stress (related: Allostatic Load, Re-Traumatization)	• The experience of stressors that are enduring and without a clear ending, placing ongoing demands that threaten to exceed a person's resources • This can lead to allostatic overload (physiological wear occurring via imbalances in stress-related body functions) with several resultant health risks • Chronic stress can sometimes co-occur with re-traumatization, consisting of stress reactions and symptoms that occur consequent to repeated exposures to similar potentially traumatic events	**Follette, V. M., & Duckworth, M. P. (2012).** Introduction. In *Retraumatization: Assessment, Treatment, and Prevention* (pp. 1-8). NY: Routledge. **McEwen, B. S. (2008).** Central effects of stress hormones in health and disease. *European Journal of Pharmacology, 583,* 174-185. **Schetter, C. D., & Dolbier, C. (2011).** Resilience in the context of chronic stress and health in adults. *Social and Personality Psychology Compass, 5,* 634-652.
Community Resilience	• The ability to withstand and maintain community integrity in the face of stressors, as well as the ability to creatively respond and re-organize	**Tierney, K. (2014).** *The social roots of risk*. Stanford: Stanford University Press.
Institutional Delegitimization	• Feeling that responsible or socially protective institutions have denied or misattributed one's concerns about CEC-related health effects • Can occur through blatant denial or downplaying of health effects/risk, dysfunctional medical relationships, or (in)direct victim blaming	**Reich, M. R. (1991).** *Toxic politics*. Ithaca, NY: Cornell University Press. **Vyner, H. M. (1988).** *Invisible trauma.* Lexington, MA: Lexington Books.
Secondary Impacts	• As opposed to the actual source of contamination, the individual, community, and societal impacts, including stigma of "contaminated" areas and conflict in local groups about how to define and respond to the problem • Public health and other interventions become part of the ongoing social construction of the situation	**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,* S140-S148. **Hoover, E., Renauld, M., Edelstein, M. R., & Brown, P. (2015).** Social science collaboration with environmental health. *Environmental Health Perspectives, 123,* 1100-1106.

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