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Community-based approaches to environmental health research around the globe

Abstract: A community-engaged approach to environmental health research incorporates input and knowledge from members of a community and other stakeholders who are affected by an environmental health issue. Bringing the community voice to public health research and practice can increase the potential for translating research findings into sustainable changes and policies that can reduce exposure to environmental chemicals and other agents in order to protect children’s health around the world.

Keywords: community engagement; children’s health; environmental exposures.

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Many health outcomes, such as respiratory disease, neurodevelopmental impacts in children, and cancers, have been associated with exposures to chemicals and other pollutants that result from industrialization and globalization within countries and across national borders. Conducting research on the impacts of these exposures around the world benefits not just those in areas being studied, but all people who experience the same or related environmental health problems. Regardless of location, environmental health concerns are local issues that can benefit from engaging local communities.

The inclusion of Global Environmental Health as a priority continues a tradition of global leadership and collaboration from the National Institute of Environmental Health Sciences (NIEHS) in solving the most pressing environmental health problems and improving the lives of the most vulnerable populations. The NIEHS fosters greater scientific understanding and increased public awareness of linkages between environmental conditions and human health, conducts and supports research on environmental health disparities that highlights underlying inequities related to environmental exposures and health outcomes, and identifies strategies and means in addressing these inequities through its environmental justice projects.

Engaging communities in environmental health

A community-engaged approach to environmental health research incorporates input and knowledge from members of a community and other stakeholders who are affected by an environmental health issue. Bringing the community voice to public health research and practice can increase the potential for translating research findings into sustainable changes and policies. Involving community members helps ensure more accurate and culturally sensitive interpretations of findings, exposes them to research methods, and increases the effectiveness of research dissemination by using already established communication channels. The level at which community partners are involved in the research depends on the project goals and the abilities of partners (1). Involvement can range from one-directional outreach to shared leadership (Figure 1). In community-based participatory research (CBPR), members of a community and other stakeholders can participate in all phases of research (2). In the US, CBPR has evolved to the point where community members are leading some projects.

CBPR recognizes the community as a unit of identity and builds on its strengths and resources (3). Collaborative and equitable partnerships balance research and action in a way that is mutually beneficial to all partners. The approach examines determinants of health from a local standpoint and facilitates co-learning and capacity building. After building trust and understanding in and among the partners, research is conducted that is relevant to all stakeholders. Many times, community members are employed as community research staff or health educators. In CBPR projects, all partners receive all findings and are involved in the dissemination process.
Community-based research case studies

Uranium mining in Navajo Nation

More than 40 years of uranium mining left 1100 mine waste sites on lands belonging to the Navajo Nation, a Native American-governed territory in the southwestern US. Communities were concerned over high rates of kidney disease and other health problems among Navajos living near abandoned uranium mines and possible exposure to uranium from unregulated, contaminated water. To address these concerns, the NIEHS-funded Diné Network for Environmental Health (DiNEH) Project was formed among the University of New Mexico researchers, Navajo community members, health care providers, and policy makers. Throughout the CBPR Project, the researchers worked closely with the Navajo communities and staff to design culturally appropriate research approaches, collect data, and communicate research findings (4).

The research showed that 30% of Navajos lack access to regulated drinking water, 75% hauled water from unregulated sources, and 20% did not know whether they lived near abandoned mines. Importantly, the project provided the first real evidence linking mine-related contamination and Navajo Nation residents’ health. Living in proximity to mines and engaging in activities that increase exposure, such as washing miners’ clothes or grazing livestock near mine sites, were associated with a nearly twofold increased likelihood of hypertension, kidney disease, and autoimmune disease. The data gained from this CBPR enabled the US Environmental Protection Agency to facilitate the emergency removal of contaminated topsoil and led to the Navajo Nation banning uranium mining on its lands. The DiNEH Project is now examining possible effects of uranium exposure on birth outcomes and child development in the Navajo Nation.

Arsenic-contaminated drinking water in Bangladesh

During the 1960s and 1970s, millions of tube wells were installed in Bangladesh to prevent waterborne disease, which had been a major cause of morbidity and mortality. Arsenic, which is a known carcinogen, was discovered in the groundwater only after decades of exposure. An estimated 35–77 million people in Bangladesh consumed arsenic-contaminated drinking water. With support from the NIEHS Superfund Research Program, an interdisciplinary team of researchers from Columbia University is examining the human health implications of arsenic exposure as well as the geology and geochemical processes behind the arsenic contamination.

The Health Effects of Arsenic Longitudinal Study (HEALS) cohort, established by the Columbia researchers in 2000, consists of adults chronically exposed to arsenic through drinking water. Before launching any health research initiatives, the investigators gained community acceptance by meeting with village leaders and other village residents. They also provided medical care through HEALS clinics, which have seen approximately 20,000 people in Bangladesh. The researchers found that chronic arsenic exposure from drinking water was associated with an increased mortality rate (5). By considering the local geology, they pinpointed safe aquifers and, in collaboration with the NGO Water Aid, installed 110 wells in villages. The researchers also developed a culturally acceptable awareness program that included using songs and dances by clowns to educate villagers about the health effects of drinking arsenic-contaminated water. They trained community leaders on how to test wells using a field kit and...
how to effectively disseminate arsenic education, which will help sustain the work once the study is complete.

**Indoor air pollution from cookstoves**

Three billion people, nearly half of the world’s population, use open fires or traditional stoves for cooking and heating. These traditional cookstoves or open fires produce smoke that causes two million premature deaths each year and contributes to chronic illnesses, low birth weight, and acute pneumonia in children (6). The NIEHS has invested an estimated $9 million in research related to cookstoves and their health effects, primarily in community-based intervention studies. Cookstoves that produce less pollution are being tested. For a community to adopt this change, cookstoves must be culturally acceptable, affordable, and practical. Promoting sustained changes in cooking requires understanding traditions, social interactions, and family dynamics, which differ widely across cultures. Culturally appropriate approaches that raise awareness of the benefits of new cookstoves are crucial for acceptance. Involving community leaders, community organizations, and health volunteers in building awareness has helped increase acceptance of new cookstoves.

In Guatemala, researchers led by Kirk R. Smith, Ph.D., from the University of California – Berkeley’s School of Public Health showed that chimney stoves reduced the rate of severe pneumonia by 30% in children younger than 18 months of age, compared to study participants with traditional unventilated stoves (7). When the study was complete, all participants received a chimney stove. In Nepal, researchers led by James M. Tielsch, Ph.D., from Johns Hopkins University, are studying whether replacing traditional open burning stoves with an improved stove reduces cases of respiratory illness and improves reproductive outcomes. In Ghana, researchers led by Patrick L. Kinney, Sc.D., of Columbia University, are testing whether replacing indoor open fires with commercially available low-cost improved cookstoves improves infant outcomes (8).

**CBPR in an international setting**

The challenges that can arise when conducting CBPR in an international setting are similar to those experienced in the US. Communities dealing with environmental disparities often have some distrust and cynicism toward scientists and outsiders, making it important to gain the trust of the overall community by establishing relationships with respected community leaders and organizations. Understanding a culture, including gender roles, before trying to implement change can help bridge language and cultural barriers that might make communication and applying interventions difficult. Interventions should be affordable, usable, and readily available in the community. Education components that teach people the health impacts of exposures are necessary as well as explains why reducing exposures can prevent disease. Showing community members how to reduce hazardous exposures is vital to the research and health outcomes. Establishing strong partnerships with local organizations creates sustainable ways to work with communities on the intended public health goals. It is also important to educate and train local community members who can provide additional reinforcement.

The countries of the Pacific Basin vary greatly in culture, government, development, and wealth. These differences are important to consider when conducting environmental health research and translating findings because they might affect the community’s acceptance of research and policy change. Climate change is a specific concern for this area as warmer temperatures can lead to increased spread of disease and heat-related health effects. In addition, climate change can disrupt food sources, and the many island nations of the Pacific Basin are particularly vulnerable to extreme weather events.

The economic change occurring in this region can intensify and introduce new environmental health problems, including increased air pollution; arsenic, mercury, and lead contamination; and electronic waste.

Community-engaged research can help to address environmental health concerns throughout the world, including in the Pacific Basin countries. By building partnerships between community members and researchers, community-engaged research can be conducted to bring new knowledge to bear on public health practices and, including community members, increases the potential for translating findings into action. Engaging community leaders in research helps to bring awareness of the issues of environmental hazards, educates about research methodologies, brings the community voice to public health research and practice, and facilitates more rapid dissemination of findings.

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References


