Water Quality, Health, and Human Occupations

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KEY WORDS
- environment
- health services research
- human activities
- rural health
- water

OBJECTIVE. To introduce evidence of the critical link between water quality and human occupations.

METHOD. A participatory action research design was used to complete a three-phase project. Phase 1 included mapping the watershed of Letcher County, Kentucky. Phase 2 consisted of surveying 122 Letcher County health professionals. Phase 3, the primary focus of this article, consisted of interviews with Letcher County adults regarding their lived experiences with water. The *Occupational Therapy Practice Framework: Domain and Process* (American Occupational Therapy Association, 2002) was used to structure questions. The Model of Occupational Justice provided the theoretical framework for presentation of the results.

RESULTS. The watershed in Letcher County, Kentucky, is polluted as a result of specific coal mining practices and a lack of adequate infrastructure. As a result, citizens experience occupational injustice in the forms of occupational imbalance, occupational deprivation, and occupational alienation.

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Most U.S. occupational therapy practitioners probably take clean water for granted, but many people cannot make this assumption. Approximately 1.1 billion people worldwide do not have access to clean, safe drinking water (Mintz, Bartram, Lochery, & Wegelin, 2001). In 1998, water-related diseases were responsible for 3 to 4 million deaths around the world (World Health Organization [WHO], 1999). In rural states, difficulties in gaining access to clean water are surprisingly common. In a recent survey of 384 rural health care providers across the nation, groundwater pollution and surface water contamination were the top two health concerns (Robson & Schneider, 2001).

WHO (2001) defined *health* as a dynamic interaction between person and environment; that is, health is the ability to participate in meaningful activities within the contexts of everyday life. This is similar to the *Occupational Therapy Practice Framework: Domain and Process* (American Occupational Therapy Association [AOTA], 2002), which directs occupational therapy practitioners to assess the contexts in which people perform their human occupations, including the physical, cultural, social, personal, spiritual, temporal, and virtual contexts.

Healthy People 2010 (U.S. Department of Health and Human Services, 2000) and the *Ottawa Charter for Health Promotion* (WHO, 1986) specifically identify environmental factors as critical for human health, noting that disturbances in the natural environment can affect one's ability to function. Although the international occupational therapy literature has acknowledged to some extent the natural environment's effect on human occupations (Cox, 1995; Peachey-Hill & Law, 2000; Rozario, 1997; Whiteford, 2000; Wilcock, 1998), within the U.S. occupational therapy literature is a notable absence of information addressing the connection among clean water, health, and one's ability to carry out necessary or desired human occupations. Geographical terrain, first included in the category of physical context

in the *Uniform Terminology for Occupational Therapy* (AOTA, 1994), is rarely acknowledged, despite its consideration as "an overarching, underlying, embedded influence on the process of service delivery" (AOTA, 2002, p. 614).

Social Justice

Social justice has been defined in multiple ways. For example, *distributive justice* refers to the needs-based allocation of resources (Rawls, 1971), whereas *procedural justice* is concerned with a participatory decision-making process (Lind & Tyler, 1988). The justice of difference described by Young (1990) critically examined the social institutions that perpetuate disparities. Despite these differences in definitions, most researchers would agree that a socially just society is one in which all persons have equal rights, opportunities, access to resources, and protections. Occupational therapy practitioners have traditionally been advocates for social justice, beginning with Eleanor Clarke Slagle, who focused on the social, economic, and health issues of Chicago's marginalized immigrant residents at Hull House in the early 1900s (Kramer, Hinojosa, & Royeen, 2003; Quiroga, 1995).

An essential principle of social justice is that disadvantage results from multiple causes: poverty, lack of education, and polluted environments, to name a few. Generally, "inequalities beget other inequalities," which is why, for example, already disadvantaged people suffer disproportionately from environmental health hazards (Gostin, 2007, p. 3). Historically, ethnic-minority and working-class European-American communities have been chosen for noxious industries that are unwanted elsewhere, causing further health inequalities for those populaces (Bullard, 2000; Cutter, Holm, & Clark, 1996; Schlosberg, 1999; Taylor, 2000). The current large-scale strip-mining operations in Appalachia take place in rural mountain communities. This is an example of environmental injustice in which an industry requires a population to sacrifice the physical environment surrounding their homes. After large-scale explosions in mountaintop removal mining, land is destroyed and water becomes polluted with heavy metal by-products of the mining process. People then become ill as a result of specific coal-mining methods and a lack of industry regulation (Montrie, 2003).

Occupational Justice

Occupational justice is an emerging concept in the occupational therapy literature. Essentially, occupational justice rests on two important principles: (1) the belief that occupational participation is a determinant of health and (2) the principle of "empowerment through occupation" (Townsend & Wilcock, 2003, p. 257). Both of these concepts inform occupational therapy practice.

An occupationally just society enables access to both opportunities and resources necessary for carrying out human occupations. It ensures participation in occupations by all people regardless of differences in abilities that may result from biology or human interaction with the environment (Townsend & Wilcock, 2003). An occupationally just society is one in which people flourish by doing what is useful and meaningful to themselves and their communities. A society can experience either opportunities, in the form of occupational justice, or restrictions, in the form of occupational injustice.

Occupational deprivation is one result of occupational injustice. It occurs when "a person or group of people are unable to do what is necessary and meaningful in their lives because of external restrictions" such as environmental barriers or lack of access to needed resources (Whiteford, 2000, p. 200). According to Wilcock (1998), these external forces may include poverty, cultural values, lack of employment opportunities, illness, or disability (p. 149). Whiteford (2000) suggested that a lack of ecological sustainability might also lead to occupational deprivation.

Another outcome of occupational injustice is *occupational alienation,* a consequence of experiencing life as meaningless or purposeless (Townsend & Wilcock, 2003). For example, if human beings are reduced to doing repetitive tasks without meaning or dignity as societies become increasingly industrialized, occupational alienation can occur (Rozario, 1997). People who experience occupational alienation feel as if they are doing the same things repeatedly with little hope of change or improvement in their lives.

A third outcome of occupational injustice is *occupational imbalance.* It is based on the belief that health requires a balance between work, leisure, and rest. Without this balance, illness, burnout, or boredom often results (Wilcock, 1998). Occupational imbalance is unjust when opportunities for different types of occupational experiences differ between the "haves and the have-nots" (Wilcock, 1998, p. 144).

Kronenberg and Pollard (2005) expanded the notion of occupational injustice by developing the concept of occupational apartheid. This terminology was deliberately chosen to confront and expose the often collusive political and economic forces behind occupationally unjust circumstances. *Occupational apartheid* is defined as "chronic established environmental conditions that deny marginalized people rightful access to participate in occupations that they value as useful and meaningful" (Kronenberg & Pollard, 2005, p. 65). The concept of occupational apartheid acknowledges that there are systematic inequalities based on characteristics such as race, religion, gender, ethnicity, or social status.

Occupational injustices occur as a result of the conditions of occupational apartheid. These conditions are perpetuated both intentionally and unintentionally by power elites as a way of maintaining privilege (Kronenberg & Pollard, 2005).

The concept of occupational apartheid goes further. It not only uncovers inequalities in occupational opportunity but also obliges people to confront these realities. An awareness of occupational apartheid requires action to begin the process of analysis and a sustained program of collaboration to create substantial change. This is especially true for occupational therapy practitioners, whose professional responsibility is to ensure occupational well-being. Ultimately, occupational therapy practitioners must account for our actions because, as health professionals, we are included in the "roll-call of agents of social control" (Kronenberg & Pollard, 2005, p. 69).

This study focused on the connection between human occupations and the physical environment in the Appalachian Mountains of Kentucky. Theoretically, it was informed by concepts from social and environmental justice and the Model of Occupational Justice (Townsend & Wilcock, 2003). The purpose was to introduce evidence of the critical link between clean water, an essential natural resource, and the ability of people to carry out both necessary and desired human occupations.

Study Context: Letcher County, Kentucky

Located in the Appalachian coalfields of eastern Kentucky, Letcher County provides the physical, cultural, and social contexts for this study. When coal mining began in the 1880s, water was among the first natural resources to be damaged (Dykeman, 1974; Eller, 1982). With the advent of surface mining (i.e., strip mining) in the 1950s, environmental degradation reached staggering proportions throughout the Appalachian coalfields (Montrie, 2003; Spadaro, 2005).

Mountaintop removal is a relatively recent method of strip mining in which the tops of mountains are literally blasted away to reveal the low-sulfur coal seams that lie directly below. Although underground mining produced limited damage to the environment, the current method of mountaintop removal is the most environmentally destructive form of coal mining. It is currently permitted to allow coal to be produced as quickly and cheaply as possible. The following is a description of the process of mountaintop removal:

> Coal companies first . . . scrape away the topsoil. . . . Next, they blast up to 800 feet off mountaintops, with explosives up to 100 times as strong as the ones that tore open the Oklahoma City Federal Building. Giant machines then scoop out the layers of coal, dumping millions of tons of "overburden"—the former mountaintops—into narrow adjacent valleys, thereby creating valley fills. . . . Mountaintop removal generates huge amounts of waste. While the solid waste becomes valley fills, liquid waste is stored in massive . . . coal slurry impoundments, often built in the headwaters of a watershed. (Ohio Valley Environmental Coalition, n.d., p. 1)

In Kentucky, there are currently 88 of these dangerous coal slurry impoundments. Twenty of these impoundments are ranked as high risk for breakthrough potential (Cole & Seigel, 2001). There is a history of such impoundment breakages in Appalachia. In 1972, a coal slurry impoundment owned by the Pittston Coal Company collapsed under its own weight. When it broke, 132 million gallons of toxic coal waste spilled into Buffalo Creek, completely demolishing several towns, leaving more than 4,000 people homeless, and killing 125 people (Erikson, 1976).

In October 2000, another coal slurry impoundment broke in Martin County, Kentucky. Although no one was killed, 300 million gallons of thick, black, toxic slurry were released into the local watershed, affecting approximately 100 miles of waterways and surrounding land (McSpirit, Hardesty, & Welch, 2002; Mueller, 2000). To place this in perspective, the Exxon Valdez disaster spilled 11 million gallons of crude oil in Prince William Sound, Alaska (U.S. Environmental Protection Agency [EPA], n.d.). In the Martin County sludge spill, public and private water supplies for more than 27,000 people were polluted (Spadaro, 2005). Massey Energy, the company responsible for the spill, was ultimately fined in federal court a mere $5,500 for what was the largest manmade environmental disaster in the history of the southeastern United States (EPA, n.d.; Lovan, 2004). Between mid-December 2003 and late January 2004, five such blackwater spills from slurry impoundments polluted eastern Kentucky streams (Alford, 2004).

Located near Martin County is Letcher County, Kentucky, home of the headwaters of the Kentucky River. Situated deep within the Appalachian coalfields, Letcher County is the site of several active coal-mining operations that infuse chemical by-products, runoff, and silt into the Kentucky River. This has contributed to a "no bodily contact advisory" for 86 miles of the North Fork of the Kentucky River in Letcher County (Kentucky Department for Environmental Protection, 2004). As Letcher County residents repeatedly say, no water runs into Letcher County; it all runs out. Thus, the pollutants that enter the Kentucky River Basin in Letcher County have an impact on the water as it flows downstream. Approximately 710,000 people live in the Kentucky River Basin and rely on it for their drinking

water (Kentucky Division of Water, 1997). However, this watershed no longer provides safe water for many Kentuckians. In fact, the EPA has designated 633 miles of the Kentucky River Basin to be unsafe for human use of any kind (Cole & Siegel, 2001).

Although the goal of Letcher County's local government is to provide everyone with access to water from the municipal water system, currently this system serves approximately one-third of the county's 25,277 residents. This municipal water system draws water from the Kentucky River, transfers it into two water treatment plants in an effort to clean it, and redistributes it to county residents. Two-thirds of households and businesses in Letcher County must rely on wells for their water. Many of these private wells are not routinely tested or properly maintained, posing a potential risk for those who rely on them (Banks, Jones, & Blakeney, 2002; Marshall, 2004).

Many county residents report having had good, clean water in the past, only to have it destroyed by the blasting that occurs as part of strip mining (Marshall, 2004). When blasts are set off as part of the mining process, underground aquifers are often cracked and then contaminated, allowing oil, gas, and sediment to enter the wells served by that aquifer. When this occurs, well water is permanently polluted. At other times, the water runs out of the cracked aquifers and wells run dry. At that point, the only option is to drill another well in hopes of tapping into another underground aquifer, which may or may not be polluted by the mining process (Banks, Jones, & Blakeney, 2002, 2005).

In 2001, members of the Letcher County local government and the Community Action Team requested a partnership with the Center for Appalachian Studies at Eastern Kentucky University (EKU). The county's citizens had set a goal to clean up their water by 2012. Swamped with an overwhelming amount of data about levels of pollutants in their watershed and an uncertainty about how to analyze this data, the county asked EKU for help. The EKU Center for Appalachian Studies agreed to partner with Letcher County in a multiphase research project called the Headwaters Project (Banks et al., 2002, 2005).

Method

Participatory action research (PAR) provided the philosophical and methodological framework for the Headwaters Project (Banks et al., 2002; McTaggart, 1991; Park, 1993; Reason, 1994; Whyte, Greenwood, & Lazes, 1991). In PAR, a problematic issue originating in a community or organization is examined from the perspectives of those most affected by it (Brown & Tandon, 1983; Fals Borda, 1991; Freire, 1970). The egalitarian approach between researcher and participants is intended to break down the barriers of traditional positivistic research so that the participants may develop, take ownership of, and effectively use the emerging knowledge without fear of exploitation from outside interests (McTaggert, 1991).

No one set of PAR practices is applicable or appropriate to all studies (Israel et al., 2003). There are varying degrees of control by researchers. Stoecker (2003) designated three different roles of the participatory action researcher: the collaborator, initiator, and consultant. In all PAR, it is vital to have fully collaborative roles between researcher and participants in the development of the research question, in setting the research priorities, and in deciding how the results of the study will be used. Whatever role the researcher takes, the resulting action is the most important (Stoecker, 2003).

In the Headwaters Project, university faculty and students served as consultants, as requested by community residents. The research priorities and questions were generated by the community, with the analysis and theoretical application designated to faculty with student assistance, as appropriate. Ultimately, the county government decided on the use of the results (as described later).

In both occupational therapy and PAR, clients are actively involved in planning and evaluating what is important for them to accomplish. Recently, occupational therapists have begun to consider PAR to be a viable research tool for the profession (Letts, 2003). As the complexity of health care increases, so too does the need for research tools that can adequately handle the ramifications (Taylor, Braveman, & Hammel, 2004).

A Letcher County Citizens' Advisory Committee was formed to represent the county in negotiating the research process with EKU faculty and students. The committee was made up of adults who represented various segments of the county and included the county judge–executive, the chief elected official in the county; a local filmmaker; the owner of a restaurant; the head of the Letcher County Action Team, a volunteer citizens' organization addressing local issues; an attorney who was a former member of the local water district; a rural grocery store owner; a retired schoolteacher; the director of a rural community center serving low-income children and adults; and the local organizer for Kentuckians for the Commonwealth (KFTC), a statewide citizens' organization that routinely engages in civic activities. Ascribing to the PAR process, the citizens' advisory committee collaborated with faculty and students for 2 years (2001–2002). The advisory committee provided input and had the ultimate approval for each method of data collection as the project emerged.

Headwaters Project, Phases 1 and 2

Phase 1 of the Headwaters Project was conducted in the fall of 2001 under the leadership of EKU geography and sociology faculty. Phase 1 focused on translating water quality data into meaningful information. This was accomplished by developing bar graphs from tables of existing data and mapping the watershed of the entire county. Using available data from federal, state, and local resources and application of the geographic information system, students and faculty developed maps that clearly demonstrated the location and degree of various pollutants in the water, such as toxic metals from local coal-mining operations, total suspended solids, sulfates, iron, and bacteria (such as fecal coliform) from absent or failed septic systems. They also plotted the pH levels and the dissolved oxygen in the water, both critical indicators of healthy aquatic systems (Banks et al., 2002).

The results of the mapping project allowed county residents to see where pollutants were entering the water and the relationship of these pollutants to recent mining permits, ongoing coal-mining operations, and the lack of an adequate countywide infrastructure to handle solid waste and sewage. For example, the maps specifically identified the number and location of straight pipes that take waste (including sewage) directly from households and businesses and dump it into local streams that eventually flow into the Kentucky River, the county's source for the municipal water system. Straight pipes remain a problem throughout the Appalachian coalfields because historically many coal-mining companies built homes for miners without providing for an adequate infrastructure to handle water and sewage needs (Banks et al., 2002). Now armed with usable information, citizens and students wondered whether the water was connected to illnesses and whether local health professionals shared their concerns.

Phase 2 of the project emerged as a result of discovering elevated levels of contaminants, such as bacteria and heavy metals, in the county's watershed. This part of the project was carried out under the direction of sociology faculty. The citizens' advisory committee collaborated with students to develop a survey and a list of agencies employing health professionals throughout the county. Students then surveyed 122 health professionals, primarily physicians and nurses, to explore their beliefs and practices concerning local water quality and its impact on the health of the county's citizens. Seventy-three surveys were returned (60% response rate).

The surveys revealed that the majority of health professionals in the county agreed that (1) water quality was a serious health issue for the county's residents (87% of respondents), (2) current water treatment practices for the municipal water system were not effective in removing pollutants from the Kentucky River (69% of respondents), (3) patients were regularly directed to use bottled water (62% of respondents), and (4) specific ailments were directly related to environmental problems (77% of respondents; Banks et al., 2002).

The survey results support data collected by the EPA in 2001 (EPA, 2001), which revealed that four inorganic chemicals were present in the public drinking water system in Letcher County: cadmium, thallium, nitrates, and antimony. Short-term health effects of exposure to these chemicals include nausea, cramps, diarrhea, vomiting, liver and kidney damage, shortness of breath, shock and convulsions, and nerve damage. Long-term effects may include liver, kidney, or spleen failure; bone damage; and cancers, particularly those of the digestive system (EPA, 2001, cited in Banks et al., 2002, p. 39). In open-ended questions on the surveys, health professionals reported seeing a high incidence of patients with nausea, cramps, diarrhea, bladder and kidney infections, gastritis, and increased rates of cancer. They attributed the increased rate of these conditions to the county's poor water quality. However, when students searched for corroborating evidence in state health data, they were unable to locate any correlation between water quality and the health of county residents.

Students shared the maps and the survey results with Letcher County residents in a public forum in the spring of 2002. Enlarged maps mounted on poster board were also left in the county action team's office on Main Street in the county seat. During the open discussion, local citizens expressed astonishment and anger that state public health agencies had not established a link between local water quality and the health of county residents. They believed that the water caused many people to become ill, just as the survey revealed these same beliefs among health professionals. As a result, the citizens' advisory committee requested a listening project in which students would interview local people about their water and their health to document directly their lived experiences.

Headwaters Project, Phase 3

To respond to this request, Phase 3 of the Headwaters Project was conducted in the fall of 2002. Fourteen students (graduate and undergraduate) enrolled in Providing Health Services in Appalachia, an occupational therapy course for majors and nonmajors. The course was redesigned as a field research project for one semester. Students were trained in interview techniques and in transcribing, coding, and analyzing qualitative interviews. They were then divided into seven teams of two people each. Over 3 nonconsecutive weekends, students and faculty traveled to Letcher County and interviewed a total of 40 adults (18 years or older), including 23 men and 17 women. The *Framework* (AOTA,

2002) and the results of Phases 1 and 2 of the project were used to identify the topics to be discussed. Specifically from the *Framework,* activities of daily living, instrumental activities of daily living, routines, and activity demands were investigated. The citizens' advisory committee also gave input regarding the questions, offered space to conduct the interviews, and subsequently approved the interview format.

Interviews were conducted in the homes of participants or in public meeting places, such as the public library, the action team office, rural grocery stores, or a local community center. Interviewees determined the location of the interviews. The interviews followed a semistructured format that included closed- and open-ended questions and lasted 1–3 hr. All interviews were tape recorded. All participants signed an informed consent form and were given a copy of the form to keep.

Student interviewers began with the open-ended statement: "Tell me about your water." Students were taught to probe for follow-up information (Babbie, 2000), and some examples were provided on the interview guide (see Figure 1). Because the results of Phase 1 and Phase 2 of the Headwaters Project were used to develop the interview guide, interview questions reflected the belief that citizens experienced problems with their water. However, students were instructed to encourage expression of all information reported by the participants, including satisfaction with the county's water.

Participant Selection

The interviews had to be arranged from the EKU campus during the weeks preceding the students' presence in Letcher County (3 hr away). A list of names and telephone numbers of potential interviewees was initially provided by the citizens' advisory committee. This initial list included adults who were predicted by the local advisory committee to be open to student interviewers and willing to discuss their water quality. Openness to student interviewers was based on former community involvement in the county, such as membership in parent–teacher organizations, service in local civic organizations (such as KFTC), and volunteering in church activities or community projects. From the initial list, a snowball sampling technique (Babbie, 2000) was used to generate names of potential participants.

By the end of October, students had transcribed 40 interviews verbatim, resulting in approximately 800 pages of transcribed material. We began independently coding and sorting the interviews manually and compared the results of this initial process to determine broad themes. We then individually recoded all 40 interviews for a more in-depth analysis. Brief memos were written to identify more specific themes that emerged within the data. We compared these themes to information on the physical context and to the areas of occupation as outlined in the *Framework* (AOTA, 2002; Marshall, 2004). Amy Marshall then recoded all 40 interviews a third time using the Ethnograph 5.0 software (Qualis Research, Colorado Springs, CO) for categorization and data retrieval purposes. This supported the establishment of an audit trail through development of a numerical list of coded items that represented recurring themes from all 40 transcripts.

Member checking of individual interviews was not possible because of the human subjects' protection requirement to destroy all identifying information once the interviews were transcribed. However, we and 5 students returned to the county for a week in the spring of 2003. During an annual cultural festival, students displayed the original maps of the county (from Phase 1) and shared the results of the transcribed interviews with approximately 100 adults. These people confirmed the patterns identified in the coded interviews, often adding their own accounts of similar problems in coping with polluted water or inadequate water supplies. During this week, we also visited with residents in public dining facilities, at local grocery stores and at a local radio station where students explained their current work on the air. We also met with the county judge–executive and the county's solid waste coordinator, who confirmed our findings.

Results

As we recoded the interviews, it appeared that almost every daily occupation as identified in the areas of occupation of the *Framework* was affected by polluted water in the physical environment (watershed), as well as inside the home from well water or the municipal water supply. In addition, several new daily activities emerged, including backwashing water filters, placing special salts and potassium in water filters, cleaning well pumps to discard sediment and debris, carrying clean water into homes, and tracking permits for new mining operations to be prepared to mount community resistance to threatened water supplies.

By using the *Framework* to help shape the interview questions, we asked people how their occupations routinely occurred and how their routines might have been altered because of their water. It became evident to us that exposure to polluted water, both in drinking water and in the physical environment in local streams, ponds, and lakes, created a situation of occupational injustice. Therefore, we adopted the Model of Occupational Justice as an organizing framework to present our findings. Our findings are organized and presented below as examples of occupational injustice.

1. **Tell me about your water.** Are you concerned about it? Do you see a problem with the water in Letcher County? If so, when do you think the problem began?
2. **Do you think there are pollutants (e.g., germs, bacteria, metals) in the Kentucky River?**
   Do you think that current water treatment methods remove these pollutants?
   If not, what kinds of things do you think stay in the water?
3. **What do you think caused the Kentucky River and local streams to be polluted?**
   Bad septic systems? Straight pipes? Pesticides? Natural gas extraction?
   Deep mining or strip mining that caused acid mine drainage?
   Contaminated underground water? Anything else?_____
4. **Where do you get your water?**
   City water? A well? A spring? Other? Do you live near a stream or other body of water?
   Do you buy bottled water? Do you buy water filters? If so, how often?
   About how much do you have to spend on water/filters each month?
   Do you do without other things so you can get clean water such as medicine? Food? Clothes? Other things?
5. **Do you think that your water is—**
   Safe for drinking right out of the tap? Safe for other things, like cooking? Bathing? Laundry?
6. **What has most changed in your life because of your water quality?**
7. **Are there activities in your daily routine that you have to do because of your water . . . any adjustments that you have to make?** For example, do you have to change the way you cook? You eat? Do your laundry? Your bathing? Cleaning? Gardening? Anything else?
8. **How about your leisure and recreation . . . does the water here limit—**
   Your fishing? Your swimming? Outdoor activities? What about children's outdoor play? Do you ever tell them to stay away from the water?
9. **How does the water affect your social activities . . . things you do with family? Or friends?**
10. **How do you think the water quality affects Letcher County: Tourism? Business?**
11. **Do you get frustrated because of the water?**
12. **Do you think that the water affects your health?**
    Do you ever get sick and think it might be the water causing it?
    Would you feel comfortable telling this to your doctor or nurse? If not, why?
13. **Does the doctor or a nurse ever tell you to buy bottled water?**
14. **Are you concerned about your family's health because of the water, especially any children? What about elderly family members?**
15. **Is there any *one particular thing* that you used to be able to do that you cannot do now because of the water?**
16. **Have you done anything you haven't already told me about to try to improve your water?**
17. **What is your BIGGEST WATER PROBLEM each day?** How do you adapt to this?
18. **Who or what is the biggest help to you in dealing with the water . . .**
    Your family or friends? A church? A community group? Any certain organization? Other?
19. **Is there any one thing that you think should be done to improve the water in your area?**
20. **Is there anything else that you want to say about your water?**
21. **Can you think of anyone else that we should talk to? (record names, phone numbers)**
22. **Demographics: Male/Female_____ Age:_____ Number in household: _____**
    Ages in household:_____ Access to a municipal water treatment system? ___Yes ___ No

Figure 1. Headwaters Project Water Quality Interview (with suggested probes; Blakeney & Marshall, 2002).

Occupational Imbalance

Letcher County residents described numerous limitations in their ability to perform personally desired occupations because they had to continually reorganize the temporal context of their daily routine to adapt to their poor water quality. "Everybody has to kind of plan ahead for water. . . . [I] go to my uncle's house because he has a good source of water . . . just to be able to boil an egg for dinner." The most common accommodations when preparing meals were to boil all water before cooking, use multiple water filters, or buy bottled water to cook with—sometimes 20 gallons per month. People described two stages of cleaning produce: First, the dirt particles are rinsed off with tap water; next, the impurities from the tap water must be rinsed off with bottled water. One person questioned,

> Washing produce has become a concern, because how do we wash the produce? We sometimes don't know [whether] to eat it without washing it, or to wash it. That is a real question for us. At this point we wash it at the sink and pray and hope that we are making the right decision.

Home maintenance routines are lengthened by the increased frequency and time people spend scrubbing off water stains from commodes, bathtubs, sinks, and carpets. "I'm continuously having to scrub the bathroom fixtures with whatever I can get to get [the stains] off with." One of the most common activities of daily living for Letcher County residents is washing water filters. "We have to . . . backwash the filter . . . every night." Although one man felt "satisfied" with his water and believed that he had "good water" at his home, he explained,

> We've got 3 wells, 4 pumps, 2 tanks, 12 filters. . . . Our water is good, after we got salt and potassium filters, and chlorinators . . . then we got just regular sediment filters. Just before it goes into the house . . . we have to prefilter it through two different filters.

The water also causes discoloration of clothing. One individual explained, "I learned to wash dark colors first, and then to do the light colors right after. Not even let it sit for a while. And I still lose clothes occasionally." Most respondents stated that they simply don't buy white clothing. "When I buy clothes, I can't buy white tee shirts, I have to buy colored tee shirts because my water is so bad." The laundromat is frequented often because its source of city water is less likely to stain clothes. "I have to go to the laundry mat . . . to keep my good clothes nice—if you don't want orange all over them."

Personal care is challenging for Letcher County residents as well, particularly bathing. One resident related, "I went to run water in the tub . . . it was first black, like off coal, and then it came out all rusty-looking. Well, you come out of the tub worse than when you went in." One individual reported being forced to buy a swimming pool filter for the bathtub because it was the only way to collect all the sediment. Some reported that they routinely add Clorox to their bathwater. Bottled water is frequently used for brushing teeth, as well as coloring or applying permanent waves to hair. A commercial product called Iron-Out, used to remove iron build-up from clothing, is applied by many residents to their hair.

Significant damage happens to homes as a result of blasting, which refers to explosives that are detonated during strip mining. For those who live close to an active mining site, the extreme noise, quaking, and vibration produced by the blasting are highly disruptive and dangerous, especially when their homes are hit with "fly rock" (i.e., flying boulders). One respondent recounted,

> I've been sitting there watching television and they'll blast and my windows will shake like they're coming out of the house and my chair will move around. . . . I've had my daughter sitting on a milk crate in my garden picking vegetables and the blast has almost knocked her off the milk crate.

Another said, "You cannot sleep in that holler [neighborhood] at night. . . . All you hear is boom, boom, boom, boom. . . . I mean, they are interrupting people's lives here."

The performance of many daily occupations such as these are filled with alterations of what many would consider to be typical routines, resulting in occupational imbalance. Recurring themes included the amount of time that people spent performing various occupations; the degree to which people reported changing or adapting their routines; the sequence and timing of their activities; and the impact of the physical environment on daily life.

> Everything in my life has changed: from life to death. That's what they're doing—they're putting us in the grave, really . . . . It's just worry, worry all the time. Sit and worry about the water, sit and worry about the bills. It's just completely changed our lives.

Occupational Deprivation

Letcher County residents also experience occupational injustice from being deprived of participating in valued occupations because of contaminated water. One prominent theme that emerged from the interviews was people's recollections of Letcher County before the strip mining. Because of the abundance of rivers and streams in this headwaters region, the water used to be a central part of people's daily lives. Residents recollected engaging in a wide variety of play and leisure occupations involving water. Swimming, wading, fishing, catching minnows and crawdads, boating, picnicking, and gardening were some of the favorite occupations mentioned by respondents. One resident recollected,

> A few years back, we'd take the kids and go out and have a good time, but now I'm just about afraid to let the kids get in the water because of the . . . pollution and stuff in there . . . 5 years ago it was a treat to get in your inner tube, load up your pickup and go down and spend a day at the beach . . . but the last few years . . . I won't take mine down there.

Another individual said,

> We used to picnic on the river a lot . . . we'd go to Cumberland or to Poor Fork for a swim. Everybody went to a place called Slick Rock. We would go camping, fishing . . . I wouldn't camp now if somebody held a gun on me.

Other than going to stocked ponds or nature preserves, there is little opportunity to fish. If people do fish, they typically throw them back: "I just pick them off and throw them back and let them go." Gardening is another occupation that has been affected. "We've got that little stream that runs by our house . . . I know it's polluted, and . . . some people say, 'Well, won't that damage your crop?' [The plants] are dying for lack of water already, and so I'm using that as a last resort."

Residents are deprived of engaging in their favorite leisure occupations because of safety concerns about the water. These occupations' significance lay not only in personal and cultural meaning to residents but also in their sustenance value. Potential income is lost for people who think it is no longer safe to sell produce from their gardens. Others have given up eating fish that they've caught locally, a common method of stretching limited food budgets. For a rural, economically depressed area such as Letcher County, these occupations are not easily replaced.

Occupational Alienation

The inability of residents to exercise choice or control over their daily occupations because of environmental destruction is a source of alienation. They expressed feelings of apprehension about going into public as a result of difficulty in maintaining their clothes and other personal items. This was obvious in statements such as, "You can imagine getting up to go to church on Sunday morning and go smelling like gasoline [due to pollutants in the water]" or "I pride myself on the way that I look when I go out in public . . . it makes you feel ashamed to have to go out with something that was bright and pretty, now yellow and dingy. You know, it begins to affect your self-esteem and things like that."

People are not only uncomfortable about going into public places but also feel self-conscious when family or friends visit their own homes. "When company comes from the city . . . they look at you, wondering why your bathroom is so skuzzy looking. . . . People come to your house and they're not used to seeing iron stains."

Respondents perceived a hierarchy of power relations. Despite its best efforts, the county government is left relatively powerless in the face of the corporate interests of the coal industry and the power it wields at state and national levels. Residents cited the leniency or lack of enforcement of laws, such as the Clean Water Act, which was created with the intent to hold industry accountable to environmental standards. Many such laws are so weak, mismanaged, or unenforced, however, that no one benefits from their original intent. Even conspicuous or widespread damage is ignored. One respondent stated,

> [The coal companies] dump diesel fuel over the mountain, it comes into the stream, down the creek it goes, and we got to deal with that, and they don't care if . . . sludge runs over in the creek or they push barrels of oil over there and it rolls down the creek . . . nobody worries about it.

Many residents feel, however, that they have no recourse against what is the only major industry in the county: "There are bad consequences when you buck the system. You know that any place you go. But right here in Letcher County, it's the worst in the world." Challenging a coal company may result in loss of jobs for family or friends.

At times, a sense of grief and alienation pervaded their statements: "People's spirit . . . has degraded . . . because of the degradation of the river . . . if you spend all that time being unable to combat it, sometimes you just kind of lose hope and join in and think that the river is unrecoverable." They expressed their belief that the coal industry has an unfulfilled responsibility to the public.

> Mining industries came in, they raped our land, stripped it, left it, and they left chemicals all around. It does not bother them because most of them that come and dig, they live in . . . other states. It does not bother them that these chemicals are left in the water.

One woman said,

> One day—this is the way I feel—I think the day will come when water will be more of a concern than coal. You can't drink the coal. But we do need water. That is a necessity of life. But these companies come in to make a fast dollar. They want to get it as fast as they can, and they would like for the people to shut their eyes, let them get the coal, and move on out. Then what do you have left? Nothing. Coal's gone. Lumber's gone. All you got left is a bunch of mud, and mountains are took off, and no water. I believe the day will come when water will be worth more than coal. We can do without the coal, but we can't do without the water. So that's the way I look at it. I got grandchildren coming up and I'd like to see them have some water and a place to live. That's about the way that I would sum it up: The water is worth more than the coal.

Letcher County residents, including local government officials, have virtually no trust in the coal-mining industry or in state and federal regulatory agencies. However, many local citizens are committed to challenging the industry through both individual and collective political action. Several people in the county developed new roles in the area of civic leadership: organizing members of their immediate neighborhoods to consider class action lawsuits against international coal corporations or organizing groups of citizens to travel to the state capital to lobby lawmakers in support of specific legislation. Some citizens also volunteered to give public testimony at legislative hearings. One woman was successful in securing a visit from a *New York Times* reporter who documented widespread environmental degradation, including water contamination, in her community.

Several social justice organizations in Letcher County provide support for people to confront issues collectively. These organizations demonstrate that local citizens are committed to working for justice in their community and nation. As one informant said, "I try to do a good job . . . if I'm not trying to do the best I can to improve water quality in my own personal environment, how am I going to provide that leadership to others?"

Discussion

The *Framework* acknowledged the contextual features of occupational performance by describing them as "overarching, underlying, embedded influence[s] on the process of service delivery" (AOTA, 2002, p. 614). This study demonstrates the vital connection between clean water in the physical environment and one's ability to engage in human occupations. Citizens of Letcher County were unable to carry out some of their daily occupations without making constant adjustments. Routines that typically become habits for most Americans were disrupted in their lives. New routines that were not necessary before the destruction of underground aquifers also had to be added to their daily occupations.

Residents of Letcher County also lost access to valued leisure occupations when local streams, lakes, and ponds became polluted. This created a profound sense of sadness and grief (Frances, 2006). They recognized that their rural county lacked access to museums, theaters, and other resources typical of urban environments. However, their expectation was that living in a rural area ought to provide the benefits of outdoor recreation in a safe, natural environment. Many felt forced to abandon valued outdoor leisure occupations altogether because of degradation in the physical environment.

The process of constantly adapting daily routines while adjusting or abandoning meaningful leisure occupations eventually became exhausting. One woman summed up the situation when she said, "I am sick and tired of water being the center of our lives." As Townsend and Wilcock (2003) argued, when people's daily occupations are regimented, confined, and exploited, it becomes a matter of justice. In Letcher County, international energy corporations engaging in contemporary coal-mining methods held economic and political power at state and national levels. At the same time, those living in the coalfields of Letcher County experienced occupational alienation, deprivation, and imbalance as a result of the privileged status afforded to their corporate neighbors who were free to ignore laws regulating the environment. Such systematic inequalities constituted a situation of occupational apartheid in which Letcher County residents were repeatedly exploited and marginalized.

In January 2003, a comprehensive report of the Headwaters Project was compiled by EKU faculty and was shared with their research partners in Letcher County. As of March 2005, the county judge–executive reported that data from the final report had been used to obtain $24 million in grant monies for water improvement projects. This use of the research results is in keeping with the PAR process in which data are used to address a specific problem. Although the county has made significant strides in addressing water quality in people's homes, many people still must rely on well water. In addition, the situation of occupational injustice remains throughout the county as residents continue to struggle with an increasing degradation of the natural environment and loss of leisure occupations.

Study Limitations

Although the snowball sampling technique is a well-known field research method, in this case it limited the participants to those who had telephones. Because Letcher County is listed by the Appalachian Regional Commission (2001) as persistently distressed with a 27% poverty rate, a significant number of households in the county have no telephones. The necessity of a telephone for arranging interviews meant that the poorest residents in the county were excluded from the sample. In addition, although African Americans are the primary minority ethnic group in the county, they represent only 0.5% of the population (U.S. Census Bureau, n.d.), and they are not represented in the sample.

Second, students were directed to people who might be willing to talk with them or those known to have concerns about their water. Thus, we have limited information from people who may think that there is no problem with the water. However, scheduled interviews could not always be conducted because of unforeseen events. In these instances, students frequently approached strangers and asked if they would be willing to be interviewed. Students usually found people willing to talk about their water.

Implications for Occupational Therapy

In the *Framework* (AOTA, 2002), occupational therapy practitioners are encouraged to consider organizations, populations, or entire communities as our clients. This study demonstrates that practitioners may act as consultants to help community members identify factors that lead to poor health and occupational injustice. Intervention to address occupational and social justice issues may include involvement in community groups and the media to increase public awareness; facilitation of group discussions in community agencies, health centers, or schools; and social action at rallies, health fairs, boycotts, workshops, and other social events (Wilcock, 1998, p. 227). Universities, community activists, other professionals, and community organizations that advocate for social justice can be resources for those who recognize that a community development approach is required for better health in a local population. ▲

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