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Rural Public Health Policy Models to Address an Evolving Environmental Asbestos Disaster

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ABSTRACT The health-related dangers of asbestos exposure were recognized early in the 20th century when occupational exposure was found to be associated with excess pneumoconiosis among asbestos industry workers. Today, the epicenter for examining the public health effects and the human toll that this toxin has had on a population is located in the rural community of Libby, MT. Rurality and multideterminants of health frame both the history of asbestos-related disease and the service/policy challenges within a community dealing with chronic illness and designation as a Superfund clean-up site. Despite efforts by public health advocates to address the lingering aftermath of an environmental disaster in this community, policy gaps exist that continue to impact the population's health. The purpose of this paper is to describe the history and outcomes of asbestos exposure in a rural community and discuss 3 models that provide public health policy insights related to rural health and health care for a community affected by both a sentinel and ongoing environmental event.

Key words: asbestos, disaster, environmental health, health care access, rural public health policy.

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Researchers during the mid-20th century conducted clinical and epidemiological studies and documented the physical effects of asbestos exposure and disease in workers (Selikoff, Churg, & Hammond, 1965; Walker, Loughlin, Friedlander, Rothman, & Dreyer, 1983). However, the private sector initially failed to warn workers of the known hazards and the public sector was slow to implement protective policies (Budgen, 2004; O'Reilly, McLaughlin, Beckett, & Sime, 2007; Schneider & McCumber, 2004). In the past 15 years, federal agencies have documented the current state of asbestos-related exposure through public health assessments (Agency for Toxic Substances and Disease Registry [ATSDR], 2001), enhanced regulation (Environmental Protection Agency [EPA], 2005a; Occupational Safety and Health Administration [OSHA], 1994), and protective policy recommendations (National Institute for Occupation Safety and Health [NIOSH], 1997, 2003). Nonetheless, with multiple agencies involved and without a single agency assigned to oversee present and future exposure, prevention, and disease management,

public health policy gaps exist related to ensuring the health of the population exposed to and living with asbestos-related disease (ARD).

Individuals with diagnosed ARD as well as those experiencing the protracted latency period before development of detectable disease symptoms require comprehensive health services (e.g., physical, mental, emotional, and social). Dose-response complexities, occupational/nonoccupational exposure routes, post-exposure trajectories, cofactors, health service disparities, and variations in the human response to asbestos call for a dynamic public policy model to address current and future population health issues. The purpose of this paper is to describe the history and outcomes of asbestos exposure in a rural community and discuss three models that provide public health policy insights related to rural health and health care access for a community affected by an evolving environmental event.

History of Libby and Asbestos Exposure

The town of Libby was built on the railroad right-of-way in 1892. Located in Lincoln County in the northwest corner of Montana, Libby is 35 miles from the Idaho border and 65 miles from Canada, in a mountainous, forested, and rural valley carved by the Kootenai River. Vermiculite ore was discovered near Libby in 1916 and in years to follow, full mining operations began providing economic development and jobs for local residents. The vermiculite widely used in agriculture, horticulture, and construction was contaminated with asbestos. Libby amphibole asbestos, also known as Libby asbestos, is particularly toxic to humans and has no established safe threshold exposure level (NIOSH, 2007).

Between 1924 and 1990, 5.8 million tons of asbestos-tainted vermiculite ore mined in Libby was processed at two Libby expansion areas and distributed nationally to 28 processing and manufacturing plants now listed as priority asbestos contamination sites (ATSDR, 2007). The commercial products contaminated with Libby asbestos, including building supplies, insulation, and soil amendments, were widely used throughout Libby and distributed to over 200 sites across the United States (EPA, 2005b; Global Environment & Technology Foundation [GETF], 2003). Employees, families, and community members working, living, or recreating in close proximity to mining or manufacturing sites have suffered increased risk of developing ARD through primary or secondary exposures to asbestos (Horton et al., 2006). As a result of the commercial distribution of vermiculite products, schools, businesses, and as many as 35 million homes in the United States may contain asbestos-contaminated insulation and other products (EPA, 2005b; Murray, 2003). Left undisturbed, the products pose no hazard (EPA, 2005a). However, asbestos is easily released when buildings deteriorate, are renovated, or burn (Scott, 2005; University of Montana, 2004).

National mortality surveillance of occupation-related respiratory diseases designated asbestosis as the leading pneumoconiosis recorded on death certificates from 1982 to 2000 (Centers for Disease Control and Prevention [CDC], 2004). While mortality rates decreased for other previously dominant occupational lung diseases (e.g., silicosis and coal worker pneumoconiosis) from 1968 to 2000, deaths attributed to asbestosis steadily increased from 77 deaths in 1968 to 1,493 in 2000 (annual age-adjusted death rate 0.54 per million and 6.88 per million, respectively) (ATSDR, 2001). National attention focused on Libby in November 1999 when increasing numbers of local residents were diagnosed with ARD. From 1979 to 1998 asbestosis mortality in Libby was 40–80 times higher than expected when compared with Montana and the United States (ATSDR, 2002).

Characteristics of ARD

Libby amphibole asbestos is linked to a number of ARDs and disorders including lung cancer, mesothelioma, asbestosis, pleural plaques, pleural thickening, and pleural effusions (Lockey et al., 1984; McDonald, Harris, & Armstrong, 2004; Peipins et al., 2003; Whitehouse, 2004). Developing ARD is known to be directly related to the dose and duration of exposure (American Thoracic Society, 1990, 2003). Once exposed, the protracted disease trajectory includes a 15–20-year nonsymptomatic phase followed, by increasing respiratory compromise (Ross, 2003; Whitehouse, 2004).

During 2000–2001, medical screenings were conducted by the ATSDR of 6,668 persons who had lived, worked, or recreated in Libby before December 31, 1990. Results showed that 17.8% of persons had pleural abnormalities (Peipins et al., 2003). Significant increases in asbestos-related pleural abnormali-

ties were also found among residents never associated with the mine or mining facilities and living in Libby after 1990. In 1980, the first screening of vermiculite workers living outside Libby was carried out in Maryville, OH (Lockey et al., 1984). A follow-up study conducted 20 years later (Rohs et al., 2005, 2007) found results in Maryville similar to the Libby findings.

In addition to the physiological impact of the disease, findings from two studies shed light on the psychosocial effects of asbestos exposure. Focus groups conducted in 2006 with 71 Libby residents revealed a community conflicted about the cause (mining or lifestyle) and responsibility (mining company or individual) for ARD and a sense of "stigma" associated with being diagnosed with ARD (Cline, 2007). In another study to explore the health status of a national cohort of persons exposed to Libby asbestos, preliminary findings indicated that for 436 persons completing the Center for Epidemiological Studies Depression survey, 33% scored in the range recommended for clinical follow-up (Winters, Hill, Kuntz, Weinert, & Rowse, 2006). Researchers from both studies suggested that communication between scientists and community members is crucial with further research needed to identify effective communication strategies to better understand the health effects of the community contamination.

Rural Culture and Influences

Understanding the environment where people live requires knowledge of individual-level variables (e.g., socioeconomic status and educational level) and contextual variables, such as the geographical aspect of an area (Berkman & Kawachi, 2000). A person's geographical residence can affect attitudes and behaviors and there is considerable evidence that local environments are related to health outcomes (Hawe & Shiell, 2000; Krieger, 2000; Link & Phelan, 1995; Winters, Cudney, Sullivan, & Thuesen, 2006). Generally speaking, rural Americans are older, less educated, and in poorer health than their urban counterparts. Rural residents tend to earn minimum wage, are uninsured or underinsured, lack transportation and other basic services, lack access to specialized health services, and face increased health care costs (Gamm, Hutchison, Linnae, Dabney, & Dorsey, 2003; Institute of Medicine [IOM], 2005). According to the 2000 U.S. Census, approximately 2,600 people live in Libby with an additional 8,000 individuals in the surrounding valley. With a total population of 18,722 and <6 persons/square mile, the county qualifies as "frontier," a term used to describe sparsely populated rural areas far from population centers and services (Rural Assistance Center, 2008). All of Lincoln County is classified as a Health Professional Shortage Area and designated a Medically Underserved Population (Health Resources and Services Administration, 2008). Median household income in Libby is half of that reported for U.S. households and the number of persons below the poverty line is 4% higher than for the United States as a whole (U.S. Census, 2000a). Approximately 18% of the total population in the county is uninsured compared with 16% for all Montana counties (U.S. Census, 2000b).

Knowledge of the uniqueness of rural persons is necessary for the development and implementation of effective health care policy in sparsely populated areas. Several traits have been attributed to rural dwellers: hardy, self-sufficient, independent, conservative, work oriented, religious, of traditional moral values, distrusting of "outsiders" and "newcomers," and respectful of "old timers" (e.g., persons who have lived for extended periods of time in the community) (Bushy, 1993; Lee, 1998; Lee & Winters, 2006). Because of the sparse population, persons living in rural communities are identifiable due to lack of anonymity (Lee, 1998).

When dealing with health issues, rural persons tend to consult with a lay network of family and friends (Boland & Lee, 2006; Ciarlo, Wackwitz, Wagenfeld, & Mohatt, 1996; Lee, 1998; Long & Weinert, 1989) before receiving formal care, which often comes from health care providers they know through associations other than the provider/client relationship. Access to health care providers, especially health care specialists such as pulmonologists, is an ongoing challenge for rural dwellers. Only 10% of physicians in the United States practice in rural areas, although nearly 21% of Americans live in these areas (Barley, Reeves, O'Brien-Gonzales, & Westfall, 2001).

An Evolving Environmental Disaster

In contrast with elements of a typical disaster (sudden and obvious destruction, damage, or loss), the events leading up to Libby's designation as a National Priorities List (NPL) Superfund site (EPA, 2002) spanned 78 years (1924–2002). The area's history and the ensuing environmental and human impact qualifies the

community as the site of the worst environmental disaster in United States (U.S.) history. The incident in Libby is best characterized as a catastrophic event influenced by commerce, rural culture, and the science of occupational asbestos hazards, which developed throughout the 20th century. As with most natural or human-caused events, recovery is often the most challenging stage of the disaster, requiring resources and long-term restorative efforts. The consequences of an ambiguous recovery can compromise a community's consensual adaptation and solidarity (Cuthbertson & Nigg, 1987) as residents with no disease, latent, early, and advanced ARD struggle to live with uncertainty and deal with community-level environmental cleanup, conflict, and stigma (Cline, 2007).

Regulations and Asbestos Exposure Policy Gaps

In 1970, OSHA established the first federal guidelines for workplace asbestos exposure with amendments to the law in 1986 and 1994 addressing the dangers of asbestos and reducing the time-weighted-average permissible exposure limit. The final rules required exposure monitoring and mandatory chest X-rays for employees but the law created no postemployment provisions despite the lengthy disease development period.

In February 2002, the EPA listed Libby as an NPL site and the area became a Superfund asbestos cleanup and removal area (EPA, 2002). However, the Libby disaster failed to prompt a public health emergency declaration as provided by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (EPA, 1980; Whitman, 2003), which would have assured health coverage for the affected population (Oversight Hearing on EPA's Cleanup, 2008). In addition, a national public health warning was never issued to homeowners regarding the hazard potentially embedded in U.S. homes (Libby Community Advisory Group, 2007; Murray, 2003). Information alerting the public to the dangers and management of building products containing asbestos can be found on national and state Web sites (EPA, 2008; Montana Department of Environmental Quality, 2007). Nevertheless, the general public may not be aware of this home hazard. Legislation banning asbestos in products was reintroduced for deliberation by the 110th Congress (Committee on Energy and Commerce, 2008; Dingell, 2008) but has yet to be signed into law. In addition to banning asbestos in the United States, this law (S. 742) would provide for the establishment of an ARD research and treatment network with geographically distributed centers providing clinical trials on every aspect and stage of ARD from detection to palliation of symptoms to pain management of advanced disease.

In summary, three primary policy gaps exist. First, the lack of a public health emergency declaration has left a highly underinsured/uninsured population living in a Health Care Professional Shortage Area at increased risk of not receiving necessary health services. Second, no one agency is assigned oversight of present and future holistic management and tracking of the exposed population and no national mechanism for determining who is ill and their stage of illness is in place. Finally, poor coordination among key federal and state agencies compromises oversight, outreach, and education activities for decreasing exposure to asbestos nationally (GETF, 2003).

Public Health Policy Frameworks to Address ARD

A dynamic public health policy that consistently addresses the immediate and long-term health care and health protection needs of individuals is essential for management of the national cohort impacted by exposure to Libby asbestos. Advocacy for a comprehensive policy including research on the health status and health care access needs of the population (Winters et al., 2006) will facilitate a national discussion of the disease that continues to unfold from this disaster in Libby and other communities in decades to come.

Although government clearly has a role in policy decisions related to national hazards, the collective wisdom of local citizens as beneficiaries of the disaster aftermath should also contribute to the dialogue (Scutchfield, Ireson, & Hall, 2004). With complex issues yet to be resolved, the following public health policy models provide a starting point for addressing rural and local community perspectives and multideterminant factors influencing health status and access to services issues.

An ecological public health model

Since 1990, researchers from Sweden (Dahlgren & Whitehead, 1991, 2007; Di, Whitehead, Gilson, Dahlgren, & Tang, 2007; Whitehead, Dahlgren, & McIntyre, 2007), Canada (Evans & Stoddart, 1990, 2003), and

the United States (IOM, 2000) proposed ecological frameworks to address a range of factors influencing the health of populations and communities. Characteristics common to each framework included recognition of both positive and negative social, economic, cultural, and environmental factors interacting with biological and behavioral components (IOM, 2003).

Evans and Stoddart (1990, 2003) suggested that health outcomes improved when a community organized to address medical and nonmedical health determinants in order to affect public health policy. As the determinants of health are researched and refined, details emerge on the significance of studying "specific pieces of the (determinants) puzzle" (Evans & Stoddart, 2003, p. 373) to better understand influencing factors and perhaps more importantly, the complex interactions among factors impacting the population's health. Five action strategies further contribute to the initial work of Evans and Stoddart with recommendations for achieving health for citizens: (a) build healthy public policy; (b) create supportive environments (e.g., physical, social, economic, cultural, spiritual); (c) strengthen community action; (d) develop personal skills (e.g., self-care, health literacy); and (e) reorient health services (Ottawa Charter for Health Promotion, 1986).

Developing and evaluating public health policy requires all stakeholders (community members, researchers, health care providers, and policymakers) participating in health improvement decisions. Ecological public health models have been in place for the past 10–15 years but have not been specifically applied in rural communities experiencing the long-term effects of an environmental disaster. However, this model has been used by rural researchers to call attention to the full range of health determinants essential for improving the population's health and eliminating health disparities in rural communities (Meit, 2004).

Rural access to care model

One approach to addressing an evolving disaster with residents at all stages of bio-psychosocial impact (from no impact to maximum effect) is to first recognize the unique challenges rural residents face apart from the event. The *Care Across the Continuum: Access to Health Care Services in Rural America* framework (Mueller & MacKinney, 2006) was based on two IOM reports (Donaldson, Yordy, Lohr, & Vanselow, 1996; IOM, 2001) and highlighted the lifetime continuum of care, social justice issues, and five principles to guide public health policy development including:

1. Health of the individual is paramount.
2. Health is an individual's capacity to pursue aspirations and happiness, unfettered by disease or disability.
3. All individuals must have comparable opportunities to obtain services needed to ensure good health.
4. Local resource capacities to deliver health care services must be considered.
5. Public policy should facilitate an individual's understanding and navigation of the continuum of care (Mueller & MacKinney, 2006, p. 43).

The *Care Across the Continuum* framework focuses on optimum health at whatever stage of wellness or illness an individual enters the system. The Libby cohort provides an ideal continuum of care test group since many community members are monitored for developing disease through the locally based Center for Asbestos Related Disease (CARD) clinic or until October 28, 2008, a state-based asbestos screening and surveillance program (ATSDR, 2008). Still, members of the community may find it challenging to navigate a complex, fragmented system for basic or specialty care health services.

A community-level model

A quote from *The Future of the Public's Health in the 21st Century* captured the significance of place in the discussion of public health policy. "The health risk conferred by place is above and beyond the risk that individuals carry with them" (IOM, 2003, p. 68). Local conditions including the physical, social, and economic environments are critical to understanding the health status and health needs of members of a community impacted by the continuing aftermath of a disaster. The locally based CARD clinic developed the *Multidimensional Model for Community Response to Slow-Motion Technological Disasters* (Hernandez, Black, Rowse, & Cline, 2007) in an effort to address the complex human and environmental public health consequences unique to the Libby asbestos cohort. This community response model is an example of community action by residents faced with an environmental, chemical, or toxic waste event and limited resources, expertise, and infrastructure needed to launch and sustain the response and recovery phases

of the disaster. While the EPA and the ATSDR maintain an important presence in the community, the community-level model identifies specific activities and roles needed from an insider's view integral to addressing the multideterminant and generational health needs of the community (Hernandez et al., 2007; Hernandez & Sedler, 2002). The *Multidimensional Model* lays the foundation for addressing components of both the ecological and rural models by adding roles and perspectives of local stakeholders impacted by the environmental event.

Policy Implications for Public Health Nursing

Public health nurses (PHNs) serve as essential advocates for populations facing the ambiguous timetable of an insidious chronic illness. PHNs provide leadership to support population health by contributing to the development of policies based on scientific evidence (Stanhope & Lancaster, 2008). The policy development core function of public health along with the Quad Council (Quad Council of Public Health Nursing Organizations, 2004) public health nursing competencies, direct PHNs positioned in large and small communities across the United States to support equitable health care services and encourage healthy communities using skills in assessment, program planning and implementation, and policy development. As community insiders, the work of rural PHNs to shape policy is facilitated by their understanding of the local environment and the persons who live in the community.

Conclusion

An integrated approach to a rural community impacted by asbestos requires an understanding of the multideterminants of health, the context (place, community, societal, and individual traits), and the development of essential partnerships among internal and external experts and advocates. This approach is necessary to achieve access to a coordinated and seamless system of care and ongoing surveillance of the health effects attributed to the toxic event. A transparent process combined with open and frequent communication among stakeholders including community members, health care providers, researchers, educators, and local, state, and federal health officials is critical for the achievement of positive health outcomes.

In Libby, rurality frames both the history of ARD issues and the service/policy challenges within a community designated as a Superfund site. Public health policy guided by research and the application of frameworks that incorporate principles of ecological health, rural continuum of care realities, and community insights are needed to address the unique multideterminant challenges of a community affected by widespread asbestos exposure.

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