

Upstream Reflections on Environmental Health: An Abbreviated History and Framework for Action

Upstream thinking considers the social, economic, and environmental origins of health problems that manifest at the population level. The upstream thinking perspective is applied to an examination of environmentally associated health problems and the opportunities that citizens have (or do not have) to access information and resources to make health-promoting choices in response to environmental health risks. A proposed framework for nurses to reduce environmental health risks includes distributive and strategic actions. Distributive actions include tracking, embedding, and translating; strategic actions include discovering through etiologic research, discovering through community-based research, advocating, and reframing. Together these actions can help formalize nursing's role in responding to citizens' concerns about environmental health problems. Key words: *environment, environmental health, nursing history, nursing theory, upstream*

Patricia G. Butterfield, PhD, RN
Professor
Montana State University
Bozeman, Montana

The environment—the chemical, physical, and biological agents to which we are exposed, along with our lifestyles—plays an important role in the development of chronic diseases such as cancer. The current view is that most chronic diseases arise from complex interactions of multiple genes and environmental exposures. Therefore, the prevention of most human diseases will require a more thorough understanding of both the genetic and the environmental contributions to their etiology.^{1(p1965)}

To date, there is an incomplete understanding of the etiology of many cancers, neurologic conditions, respiratory diseases, and disorders of immune functioning. Support for basic research addressing these conditions has increased significantly over the past 5 years; however, the work is remarkably complex, incremental, and time consuming. As the work continues, so do deaths in our clients; in the United States,

The author thanks Drs J Bellack, P Clarke, J Dixon, and J Shreffler for their guidance in developing this article and the Robert Wood Johnson Executive Nurse Fellows Program for its support.

Adv Nurs Sci 2002;25(1):32–49
© 2002 Lippincott Williams & Wilkins, Inc.

an estimated 115 persons die each day from breast cancer, 62 from non-Hodgkin's lymphoma, 61 from emphysema and asthma, and 40 from Parkinson's disease.²

UNDER-RECOGNIZED SOURCE OF EXPERTISE

This is a special time in the study of environmental health problems, and nursing has a unique role to play. For the most part, the nursing profession has devoted itself to minimizing the consequences of disease, rather than their causes. The result has been the creation of a portfolio of nursing actions and education strategies that enable persons with illness to live their lives in the fullest manner possible. However, with few exceptions, nursing has not been active in efforts to understand the etiology of disease. But nurses are listening when clients tell the story of their lives, and these stories may include important (and overlooked) clues about the etiology of disease. Clues may be dropped in the context of a client's discussion of their past jobs, hobbies, or travels. It is important not to mistake these clues for the "cause" of disease, for at an individual level they are anecdotes and may not yield important information about the origins of disease. But collectively heard, documented, and critically examined, the clues yield important information that may allow scientists (including nurses) to take the next step in recognizing and preventing disease.

Nurses understand the importance of prevention, and take the time to tailor preventive messages to meet the developmental and situational needs of clients. Through our presence in homes, clinics, and worksites, nurses provide site- and context-specific health care

that simultaneously addresses immediate health needs (eg, fitting workers with hearing protection devices) as well as more comprehensive efforts (eg, implementing hearing conservation programs) to reduce future risks. In many communities nurses are the main sentinels of surveillance and contact public health authorities when they detect unusual disease patterns by time (eg, acute epidemic of pertussis) or place (eg, point-source outbreaks of food poisoning). Following a chemical spill or railway accident, nurses are among the first health providers seen in the emergency department, providing information to family members and concerned citizens. In the hours following an incident, nurses are often key spokespersons to the local media, framing the message so that the community understands what is known, what is not known, and what steps are being taken to protect health. Nurses are experts at translating technical health information (eg, procedures, complex medication regimens) into a format that most families can understand, use, and adapt to their own circumstances. Our vast numbers and ubiquitous presence provide nursing with opportunities to assume leadership roles in local and national efforts to reduce environmental health threats to our citizens.³ Still, for the most part, nurses remain an under-recognized and under-utilized source of expertise in environmental health efforts. The national environmental health agenda has evolved rapidly over the past 3 years, and this agenda can benefit from the broad view of health that nurses bring to the table. We need to formalize what we know (ie, nursing theory, nursing science) and define what areas of leadership we can assume in order to reduce the burden of environmentally associated disease in the next generation of citizens.

This article describes an upstream framework that addresses environmental determinants of health. Because the framework is based on previous conceptualizations by nursing scholars, a historical overview of environment and environmental health precedes the framework. The article also includes: (1) a brief overview of the nature and scope of environmental health problems and (2) a summary of gaps in health services and public health infrastructure that can be addressed by nursing actions, regardless of specialty or practice setting.

WHAT IS KNOWN

It is clear that improvements in public health must be predicated on preventing new cases of disease. Currently, this much is known:

- Using estimates of global disease burden, 25% to 33% of disease occurrence is attributable to environmental exposures.⁴
- Approximately 1.2 billion pounds of chemicals that are potentially neurotoxic were released into US air and waterways during 1998.⁵
- One million US children exceed the current threshold for blood lead levels.⁵
- Asthma prevalence in children has increased 58% since 1980; mortality has increased by 78%.⁶
- Approximately 3% of developmental and neurologic deficits in children can be attributed to exposure to known toxins.⁵
- As many as 1.4 billion urban residents breathe air that exceeds World Health Organization air quality guidelines.⁷

- In a recent study⁸ of 45,000 pairs of twins, heritable and environmental contributions to disease occurrence were estimated for cancer at 28 anatomic sites. Heritability estimates ranged from 0% (cervix uteri) to 42% (prostate), with breast cancer estimated at 27% heritability (95% confidence interval [CI] = 0.04–0.41) and 63% environmental. The authors concluded that “the overwhelming contribution to the causation of cancer in the populations that we studied was the environment.”^{8(p84)}

The national environmental health agenda has moved from the perspective of high-dose exposure to single agents toward efforts to understand the consequences of low-dose exposure to multiple agents. In short, the unit of analysis is beginning to change from the agent (eg, lead, cadmium, pathogenic *Escherichia coli*) to the person (individuals and communities). In March 2001, the Centers for Disease Control and Prevention released findings from the *National Report on Human Exposure to Environmental Chemicals*.⁹ The report contained measures of exposure for 27 chemicals, including metals, cotinine, six metabolites of pesticides, and metabolites of phthalates (used in shampoo and lotion). The release of these data marked an important milestone for public health. Instead of framing the question from an agent level (ie, What levels of arsenic exposure can be documented?), it poses them from a citizen level (ie, To what chemicals have I been exposed?). Although the difference is subtle, it represents the first effort to frame exposures from the perspective of a mother who is concerned about her child's cumulative exposure, or a person with chronic illness who wonders about exposure

to several types of health risks. This change is compatible with the person-focused (versus disease-focused) view of health that is reflected in nursing practice.

WHAT IS NOT KNOWN

To develop effective frameworks it is important to understand the lack of information addressing environmental health problems. Critical data gaps include the following:

- *Inadequate data addressing disease occurrence.* In reviewing data availability, the Pew Environmental Health Commission¹⁰ concluded there was a national data gap that obscured potential relationships between exposures and disease occurrence. This conclusion was based on information that: (1) only four states track autoimmune diseases, (2) only six states track attention deficit hyperactivity disorder, (3) multiple sclerosis is not a reportable condition in most states, and (4) less than half of the nation's population is covered by a birth defects registry. There is no systematic tracking of asthma in the United States despite evidence that asthma occurrence increased more than 75% between 1980 and 1994.
- *Inadequate data addressing exposure occurrence.* Similar conclusions can be drawn about adequacy of data addressing chemical and biologic exposures. According to federal law, manufacturing facilities are required to report the use, transport, or disposal of approximately 600 chemicals to the US environmental protection agency (EPA). These

data are compiled at both the state and national levels and are referred to as the Toxics Release Inventory (TRI).¹¹ However, a recent report—*Polluting Our Future: Chemical Pollution in the US That Affects Child Development and Learning*⁵—was highly critical of the scope and timeliness of TRI data. In regard to exposure risks to children, the report notes: “There is far too little toxicity and exposure information for the vast majority of developmental and neurological toxins to allow for determinations as to whether children or pregnant women are too highly exposed to specific substances.”^{5(p4)}

- *Inadequate linkages between exposure and disease data.* Even when chemical use data are entered into national databases it is difficult or impossible to link those data with disease incidence patterns, even for those few conditions (ie, cancer) that are tracked at the state or national level. Data addressing exposure and disease are typically maintained by different agencies, with oversight by professionals from different disciplines. In many state health departments, staff members who track disease never interact with personnel studying trends in chemical use or spills. Linking exposure and disease data becomes even a greater challenge for many chronic diseases in which both environmental and genetic factors play time-dependent roles in disease development. As a study to examine genetic and environmental risks for breast cancer in 50,000 women began, investigator Dale Sandler noted: “Despite great interest in trying to discover

environmental causes of breast cancer, we don't have a lot of evidence. We don't have a lot of clues; there are no obvious places to start."¹²(pA368)

THE CHILD AS THE FATHER OF THE MAN

There may be an incomplete understanding of the links between environmental agents and disease, but we do know that when it comes to the health consequences of exposure, all persons are not created equal. Risks due to environmental exposures differ between the young and the old, as well as for those with renal disease, compromised immune systems, or a genetic predisposition to slow chemical metabolism. Among those considered most vulnerable are pregnant women and children because of their increased metabolic rate and caloric demand.³ In regard to children, hand-to-mouth contact, a high respiratory rate, and higher skin permeability mean that an exposure with no untoward consequences for an adult may exert a harmful effect on a child.¹³ Likewise, an older person taking corticosteroids for asthma may have pulmonary symptoms from airborne sulfur dioxide from the local oil refinery that might not affect others living in the same neighborhood.

Because of the long latency between exposure and disease, nurses may never see the connection between early life exposures and subsequent disease development. The pediatric nurse may never know that a toddler's exposure to lead contributed to neuro-behavioral changes that impacted that child's ability to listen, think, and sit still in school. Likewise, the school nurse may never know that past lead poisoning was instrumental in the behavioral problems of a

15 year old. Weaver¹⁴ adapted Hopkins' poem "The Child Is Father to the Man,"¹⁵ to emphasize that a clinician must address today's health problems (eg, otitis media) while, during the same clinic visit, act to prevent additional problems later in life. The author noted the following:

There is strong evidence that poor environmental conditions are the principal determinants of ill health at all stages of life, and it follows that the optimal time to intervene to correct them is early in life. . . . When it is increasingly clear that the origins of many adult diseases are in childhood or before, paediatricians should strive to work closely with their colleagues in primary care, public health, clinical genetics, education, government, housing, [and] environmental and social services toward the common goals of promoting optimum health throughout the fullness and completeness of life.¹⁴(p38)

UPSTREAM PERSPECTIVES AND CHALLENGES

The purpose of the upstream framework is to provide a guide for nursing actions to promote health by reducing environmental risks to citizens. One assumption is that there are unique opportunities for nursing to assist in protecting citizens from environmental health threats. These opportunities result from nurses': (1) presence in hospital, clinic, worksite, and community settings; (2) expertise in translating technical information into instructions that are easily understood by clients; and (3) skills in fostering health protection at the individual and collective level.

The concepts of prevention-focused and population-focused care figure prominently in a conceptual orientation to nursing referred to as "thinking upstream." This orientation is derived from an analogy of pa-

tients falling into a river upstream and being rescued downstream by health providers overwhelmed with the struggle of responding to disease (versus health). McKinlay¹⁶ chose a river to represent the natural history of disease, charging health providers to re-focus their efforts toward preventive and “upstream” activities. In a description of the daily struggles of providers to address health from a preventive versus curative focus, McKinlay contrasted the consequences of disease (downstream) from its precursors (upstream).^{17,18} The author then challenged health providers to critically examine their activities addressing disease management within a broader context of the social patterning of health.

In 1990, Butterfield¹⁹ adapted McKinlay’s upstream analogy to nursing theory, noting the profession’s emphasis on theoretical approaches that mythologized individual nurse-client relationships at the expense of broader contextual variables. A greater incorporation of health risks that manifest themselves at a population level could lead to the development of a more comprehensive understanding of barriers that clients (individual or population) encounter in protecting their health. In the current health care system, a false dichotomy exists between efforts to understand population factors that favor the genesis of disease (eg, inadequate social, economic, and environmental resources) and efforts to treat disease. Thus the origins of disease are obscured, and it is not possible to expose and systematically examine links between proximal population-based risks and their distal disease consequences. Because information addressing complex population risks is not sought, archived, or systematically analyzed, the origins of disease are reinterpreted to emphasize individual behavioral factors (eg,

exercise, diet, stress) rather than the socially constructed conditions that promote those behaviors (eg, lack of safe places to walk, easy access to high-carbohydrate snacks, mundane and repetitive work tasks). Subsequent work by Butterfield^{20,21} extended this perspective to an examination of environmental health problems and the lack of information (or conflicting information), guidance, and advocacy that clients (individual and community) face when they try and make practical and realistic decisions addressing environmental risk reduction.

One of the barriers to improving nurses’ environmental health capacity is that many institutions that employ nurses do not recognize, either through reimbursement or time allocation, nurses’ preventive health actions on behalf of their clients. Education focusing on prevention and risk reduction frequently occurs under the guise of other, more easily classified nursing actions, such as immunization administration or well-child visits. In nursing, much of our important work is quantified (rightly so) through formal mechanisms such as acuity scales and reimbursement codes. However, many other types of nursing care are delivered, but remain relatively invisible within the health care system. Environmental health education, advocacy, and screening services most likely will fall under this realm. Thus, as nurses assume greater roles addressing environmental health problems, it is important to develop models of practice simultaneously with support mechanisms that will lead to a broader acknowledgment of nursing practice. There are organizational barriers in many settings that preclude the delivery of care that incorporates an upstream perspective. Although Will Durant was referring to historians in his discussion of the context of civilization, his quote is apropos for nursing

and reflects the dilemma that many nurses encounter when they seek to practice using an expanded vision of health:

Civilization is a stream with banks. The stream is sometimes filled with blood from people killing, stealing, shouting and doing the things historians usually record, while on the banks, unnoticed, people build homes, make love, raise children, sing songs, write poetry and even white statues. The story of civilization is the story of what happened on the banks.^{22(p92)}

In health care much (but not all) of nursing occurs on the banks. In a system that documents episodic events such as laboratory tests and biopsy results, much of nursing care is delivered between events, throughout the hours of birth and during the hours of death. Nursing is what happens between, whether the between is between the hours of 11 PM and 7 AM, between chemotherapy sessions, or between Head Start visits. The work of nursing has primarily focused on helping people adapt, minute-by-minute and year-by-year, to the challenges they face over their lifetime. As nursing develops broader models of care that are more responsive to clients' concerns, the profession has an equal obligation to develop mechanisms (eg, continuity of funding) that acknowledge this level of practice.

A BRIEF HISTORY OF NURSING AND ENVIRONMENTAL HEALTH: PAST AS PROLOGUE

The upstream framework builds on the work of others and their thoughts addressing the nature of the environment and its role in health and disease. Different perspectives reflect nursing's varied interpretations of illness, the responsibility to address the proximal causes of disease, and the po-

tential of nursing actions to reduce morbidity and mortality. An overview of nursing and environmental health precedes the presentation of the upstream framework, and it provides the context for a discussion of environment as one of the four concepts (ie, person, health, environment, nursing) in nursing's metaparadigm.

Distilled to its most elementary form, the causes of all diseases are either genetic or environmental in origin; on this statement there is general agreement. Controversies tend to arise in two areas: (1) the semantic interpretations of environment and environmental health and (2) the relative contributions of genetic and environmental factors to the creation of disease. Within the nursing profession, conceptualizations of environment and environmental health have varied widely, beginning with the founder of modern Western nursing, Florence Nightingale.

The reformers: Environmental health as a tool (1850s–1920s)

Nurses frequently cite the contributions of Florence Nightingale in recognizing the therapeutic role of the environment in fostering health and recovery. Based on Nightingale's descriptions of British military hospitals during the 1850s, it is easy to understand the context for her recommendations addressing cleanliness, clean water, and light during recovery.²¹ Although Nightingale's writing is commonly referred to as the genesis of environmental health in nursing practice, it is important to consider that work within its historical context.^{23,24} Although her perspectives were visionary at the time, the conceptualization of environment advanced by Nightingale represented a very circumscribed worldview—a view that reflected the urgency of helping men who were dying on the battlefield. Overall,

Nightingale saw the patient's environment as a tool that could be manipulated in support of health.

The impact of US sanitary reform efforts yielded significant improvements in infant mortality rates, communicable diseases, and occupational conditions. In contrast to Nightingale, sanitary reformers acknowledged the community dimensions of the environment and how putative agents could enter the home from the market or worksite. However, the responsibility to improve the home environment was placed primarily on the family (ie, women) rather than on society. The social activist nurse Lillian Wald later challenged this view, maintaining that many opportunities to improve health were beyond the reach of the family. Wald noted the following:

District nursing of today follows the tradition of its earliest conception. It has been used since the beginning of its history to carry propaganda as there has been always an enthusiastic belief in the possibility of the nurse as teacher in religion, cleanliness, temperance, cooking, housekeeping, etc. My argument loses none of its force, I think, if much of this education has seemed to her lost because with greater knowledge and wider experience she has learned that the individual is not so often to blame, as she at first supposed. That while the district nurse is laboring with the individual she should also contribute her knowledge toward the study of the large general conditions of which her poor patient may be the victim. . . . Therefore her knowledge of the laws that have been enacted to prevent and cure, and her intelligence in recording and reporting the general as well as the individual conditions that make for degradation and social inequity are but an advance from the readiness to instruct and correct personal and family hygiene to giving attention to home sanitation and then to city sanitation, an advance from the individual to the collective interest.^{25(p66)}

The technologists: Environmental health as location (1930s–1970s)

In many settings public health successes addressing communicable disease later translated into fewer resources for community health nursing. During the 1950s and 1960s, technologic advances often were viewed as solutions to health problems; in this context, environmental factors were considered factors to be contained and subjugated, rather than mobilized on behalf of health. Compartmentalization of nursing by client grouping (eg, maternal child nursing) and body system (eg, neurology, oncology) occurred, with a concomitant emphasis on disease-specific risk factors (eg, cholesterol control). Tiedje and Wood²⁴ noted that, for the most part, environment was conceptualized as a location (eg, school, worksite) in nursing textbooks during the 1960s and 1970s. Significant advances in disease management and quality of life were made during this time; however, the parameters of environment decreased substantially within nursing practice.²⁶

The thinkers: Environmental health as foundation (1980s through 1994)

Two related but philosophically different views on environmental health evolved during the 1980s and 1990s. In the first of these views, environment was viewed primarily from an epidemiologic perspective, as single and multiple agents that can be assessed by nurses and minimized through therapeutic nursing actions. Because of their technical expertise in toxicology and epidemiology, occupational health nurses took the lead in this conceptualization of environmental health, devising strategies to reduce community and worksite risks.^{26,27}

In the second view, environment is a foundational element of health. Chopoo-

rian's²⁸ 1986 paper calling for a "reconceptualization" of the environment exemplified this perspective and provided the profession with a critical examination of how environmental factors were incorporated (or not) into practice. Embracing concepts from ecology and social activism, the author pointed out the limitations of a "blurred" concept of environment for nursing and how such a conceptualization limits the framing of health problems from a nursing perspective. Using federal government subsidies for tobacco as an example, Chopoorian noted: "By attending to environment as social, political, and economic structures, the interrelationships between these structures and the origin of health or illness are better understood."^{28(p49)}

The reformers (second generation): Environmental health as advocacy and prevention (1994–present)

During the 1990s several nursing organizations implemented policy initiatives to incorporate environmentally friendly practices into health care settings. Reinterpreting the motto "First, do no harm," a program titled "Health Care without Harm" was initiated through a collaborative partnership among health care organizations, including the American Nurses Association.^{29–31} By keeping the focus narrow (eg, worksite conservation practices), the program made it clear that consumption practices in health care (eg, use of plastic tubing, blue pads) yielded byproducts that posed potential threats to human health as well as long-term challenges in waste disposal and incineration.

In 1995 two national workgroups set the stage for a new perspective on nursing and environmental health. The first of these groups, convened by the Institute of Medicine, proposed environmental health com-

petencies for the nation's 2.6 million nurses, regardless of practice setting or subspecialty. Nurses were charged with: (1) understanding hazards, exposure pathways, and prevention mechanisms; (2) completing an environmental health assessment; (3) using advocacy skills on behalf of populations at risk; and (4) understanding environmental health regulations.³ That same year the National Institute of Nursing Research (NINR) convened a second workgroup to develop an environmental health research agenda for the profession.³² Both topic areas (eg, lead poisoning, air pollution) and intervention strategies (eg, communicating risk in emergency situations) were included within the research agenda. The group emphasized that because nurses are employed in so many settings, the profession is uniquely suited to conduct applied research addressing the impact of environmental hazards on vulnerable populations and communities.

Dixon and Dixon³³ emphasized that an agent-specific orientation to environmental health is insufficient in providing a framework for health protection. They proposed an integrative model of environmental health that encompassed the domains of physiologic, vulnerability, epistemologic, and health protection. The physiologic domain included an understanding of agents as well as the parameters of exposure. The authors emphasized the importance of this domain in understanding health, but noted that this perspective alone has not led to significant reductions in citizens' exposures. They concluded that understanding the domains of vulnerability (ie, distribution of hazards among groups such as the rich and the poor), epistemologic (ie, how citizens find out about hazards), and health protection (ie, environmental health engagement) was necessary for nurses to have a fuller reper-

toire of actions than would be elicited from the physiologic domain alone. In separate papers, Salazar and Primomo²⁷ and Shrefler³⁴ proposed a model that encompasses nested ecologic systems and challenged nurses to embrace a broader understanding of person-environment interactions. Bellack and colleagues²³ queried nurse practitioner programs about the relative emphasis of nine environmental health competencies (versus other types of clinical competencies) in their curricula. Three percent of the programs noted that environmental health topics received a strong emphasis, while 58% and 37%, respectively, noted that this area received minimal or moderate emphasis. The authors suggested that the most effective way to enhance environmental health content in programs was to modify content-driven curricula to enhance critical thinking and inquiry activities that included information on local environmental health problems.

THE PERFECT AS THE ENEMY OF THE GOOD

Although there continues to be some lack of coherence regarding interpretations of environment and environmental health, there remains a need to move ahead in a timely manner with the development of frameworks to guide nursing actions. There are several reasons for this urgency. One is the changing nature of disease occurrence in this nation and others. Although most textbooks continue to highlight successes in communicable disease control and overall decreases in mortality rates, these accomplishments are overshadowed by recent bioterrorism acts in the United States, well-documented rates of global climate change, continuing losses in the global acquired immune deficiency syndrome (AIDS) epi-

demic, and preliminary evidence that changes in chronic illness patterns may be occurring in children. The second reason to move ahead is that nursing has historically played a uniquely powerful role in environmental health actions, but one that has decreased in substance since at least the 1950s. The scope of nursing is being increasingly defined by those outside the profession who restrict nursing practice through imposed taxonomies and the perpetuation of employment conditions that preclude the delivery of comprehensive care. There is an opportunity to reestablish the legacy of environmental health vigilance previously held by our profession.

The main reason to accelerate nursing efforts in environmental health is our constituents—clients, consumers, and communities—are seeking guidance on how to respond effectively to environmental health threats. Parents are concerned about the cumulative effects of multiple toxicants on the lifespan of their children. Citizen groups struggle with interpreting risk assessment from local point-source polluters that is based on incomplete data and insufficient methodology. Workers are unable to interpret chemical data (eg, material safety data sheets) and make informed decisions on behalf of their health. However, despite an overabundance of technical information addressing specific agents (eg, lead, sulfur dioxide), there is little guidance for families who are attempting to take simple actions to respond to environmental health threats, either at the individual or the collective level. The challenge for the current generation of nurses is to refine a conceptualization of environment and environmental health that is both visionary and practical, one that is specific enough to provide a directive for practice yet is capable of mirroring the rich com-

plexity of the natural and created world. Efforts to distill the complex nature of environmental health for nursing need to continue, but the lack of conceptual coherence does not justify a delay in the refinement and testing of nursing strategies. The perfect should not become the enemy of the good.

AN UPSTREAM FRAMEWORK

In the proposed framework, nursing actions are grouped into the categories of *distributive actions* and *strategic actions*. For purposes of discussion, the term *distributive* refers to daily actions that extend nurses' understanding of environmental health risks and the dynamic nature of those risks. Some distributive actions involve "tasks," where nursing activities are being modified to incorporate environmental health surveillance activities. Other distributive actions do not involve a task per se, but a change in thinking about one's daily practice that allows environmental health issues to be recognized, named, and integrated. Overall, *distributive actions help build environmental health capacity within the profession and are, for the most part, ongoing activities that are integrated into nursing practice*. In

contrast, *the key element in strategic actions is discovery—contributing to the advancement of clinical environmental health sciences*. Generally these are breakthrough actions that involve investigations, research, or a major reconceptualization of thinking about an environmental health topic. The box entitled "An Upstream Framework for Environmental Health: Characteristics of Distributive and Strategic Actions" provides a summary of characteristics of distributive and strategic actions.

The differentiation between distributive and strategic actions is intended to provide nurses with some perspective on the manner in which their actions extend the expertise of nursing and lead to better responsiveness to client needs. The terms are not intended to be mutually exclusive. The box entitled "Upstream Framework: Types of Distributive and Strategic Actions" lists types of distributive and strategic actions.

Distributive actions

Within the context of environmental health, distributive actions involve "on-the-banks" activities and focus on the integration of environmental health principles and skills into the daily work of nursing. One rudimen-

An Upstream Framework for Environmental Health: Characteristics of Distributive and Strategic Actions

Distributive actions—daily efforts

- Improve existing environmental health data
- Strengthen communication among organizations
- Establish an ongoing dialogue between nurses and citizens

Change occurs "along the banks"

Strategic actions—breakthrough efforts

Advance the knowledge of environmental health problems through:

- Scientific discoveries
- New awareness of an existing environmental health issue

Change occurs at the "confluence of new and old knowledge"

Upstream Framework: Types of Distributive and Strategic Actions

Distributive actions

- Tracking
- Embedding
- Translating

Strategic actions

- Discovering—through etiologic research
- Discovering—through community-based research
- Advocating
- Reframing

tary example is modifying nursing assessment forms so that more comprehensive environmental exposure data are collected and archived in medical records. Because of the extensive recordkeeping of nurses, even this seemingly small step could lead to significant improvements in environmental exposure data throughout the public health system. These data could yield clues enabling both basic and applied scientists to study the origins of breast cancer, neurodegenerative conditions, and other conditions. *Distributive actions focus on integration and vigilance and are grouped into the broad categories of tracking, embedding, and translating.*

Tracking exposures and diseases

A top priority of both the Pew Environmental Health Commission and the Agency for Toxic Substances and Disease Registry has been to develop and implement a national tracking system for exposures and diseases. Many potential linkages between exposures and disease cannot currently be examined because surveillance systems are incomplete. Systems that address diseases (eg, tumor registries) continue to be structurally and functionally separate from those that address exposures (eg, hazardous material spills). Nurses can play a significant role in improving the quality of existing surveillance systems by ensuring uniform and com-

prehensive reporting of conditions required by their state and local health departments. In addition, they can help overcome exposure-disease outcome gaps by improving medical records to include better reporting of past exposures to environmental agents.

Embedding environmental health information into “traditional” nursing practice

Despite the fact that a significant proportion of disease is attributable to environmental factors, environmental health is often viewed as an appendage of occupational health nursing rather than central to nursing’s vision of health. The Institute of Medicine clearly specifies that nursing competencies in environmental health are to include all the nation’s nurses, not just those practicing in public health or worksite settings. To respond to this mandate, it is important to recognize the centrality of environmental health to nursing and modify nursing documents to reflect this emphasis. To this end, data collection tools used predominantly by nurses should be modified to facilitate the collection of environmental health information from clients. For example, questions asked about past exposure to lead can and should be included on assessment forms for adult and pediatric clients with a diagnosis of hypertension, attention deficit hyperactivity

disorder, or renal disease. If there is one thing that nurses can do to make a remarkable and positive impact on public health for the next generation, it is modifying client records to improve the collection of environmental health assessment data.

Translating technical information into user-friendly choices for clients

Ten years ago most citizens did not have access to information about potential environmental health hazards in their community. Right-to-know legislation and Internet access have now placed these data at the fingertips of interested parents and grassroots community groups. However, despite easier access to environmental health data, the information is often organized in such a manner that citizens cannot use it to make health-promoting choices. Hazard-specific information (eg, reducing exposures to pesticides) can be useful, but does not encompass the full range of experiences of families; to be useful, environmental health information needs to be applicable at the person level rather than the exposure level. Nurses can take technical information from material safety data sheets (MSDS) and other sources and translate it into family-specific actions. For a family living in a rural community with limited financial resources, the nurse may assist in identifying key risk areas, such as potable water quality, pesticide drift, and indoor cigarette smoke, and help the community take steps to minimize risks in these areas.

Strategic actions

As opposed to distributive actions, which provide ongoing vigilance of environmental health threats in the community, strategic actions involve a targeted response to a par-

ticular event or situation. Generally, strategic actions are intended to facilitate an environmental health agenda through either a new discovery or new awareness of an existing issue. *Strategic actions are not tasks, but involve breakthrough projects or initiatives that help to reframe environmental health issues in a manner that places citizens' health first.* In the context of upstream thinking, strategic actions occur at the confluence of existing and new knowledge. Such actions are listed under the umbrella concepts of discovering (addressing two facets of discovery), advocating, and reframing.

Discovering through research advances addressing the etiology of environmentally induced disease

There are some topic areas that are well suited to etiologic research directed by nurse scientists. In 1995, the NINR convened a workgroup to develop a research agenda addressing environmental health.³² Research examining proposed etiologic links between environmental agents and the development of Parkinson's disease and asthma were listed among the recommendations made by the NINR workgroup. In a comprehensive review of literature addressing environmental epidemiology topics, the National Research Council noted the abundance of small-scale studies conducted by state or local health departments.³⁵ The term "gray literature" refers to such studies, which may be available locally, but are not published in peer-reviewed publication. Nurses often play a primary or supporting role in conducting such studies, which are often performed with limited resources under a tight schedule. In their recommendations, the authors suggest that "fewer, but better studies could advance the public wel-

fare.”^{35(p173)} Nursing can assume several roles in support of etiologic research. Nurses with a sound topic and methodologic background can and should be directing research addressing the etiology of disorders that impact our clients. Nurses without such a background can still play a critical role supporting such research, including providing ideas for questionnaires or directing data collection activities. Study quality can be enhanced through the development of research partnerships between agencies and academic health science centers. Together these organizations have a shared goal of preventing future cases of disease.

Discovering community-based research approaches that lead to a more client-responsive system

Understanding the antecedents of disease is necessary but not sufficient in reducing the burden of environmentally induced disease. More than agent-specific and disease-specific knowledge will be required if communities, corporations, and government organizations are to make sound decisions about risk reduction. It is important to expand our knowledge about how citizens view environmental health threats and what options they think are available to them. To that end, nurses can play a significant role in research efforts to examine strategies for community involvement in decisions addressing local environmental health issues. Policy makers have acknowledged that through placement of industrial facilities, a disproportionate burden of exposure has been placed in low-income communities. As a profession, nursing is well suited to conduct studies that examine disparities in health opportunities in communities of

color, as well as with underserved and marginalized subgroups.

Advocating for clients (individuals and groups) with environmental health concerns

Citizen groups are often on unequal footing with industry when it comes to local environmental health policy decisions. Public meetings addressing site-specific events often descend into shouting matches that ultimately become unproductive for all participants. Many health providers forget that partnerships with citizens involve an actual partnership—one that encompasses an ongoing dialogue and exchange of information, not a single meeting characterized by one-way (from experts) communication to (rather than with) citizens.

One of the modes of nursing advocacy at a population level is to support the development of health policies that are responsive to citizens' concerns. Environmental health policies primarily focus on the regulation and monitoring of agents with toxic potential. A significant part of this work involves permitting point-source facilities. The issuance of permits is predicated on a health risk assessment, which is to provide evidence that public health will not be endangered by any air, soil, or water discharges. Modeling procedures used in risk assessments are complex and often based on toxicity data extrapolated from other facilities. A growing number of health professions have concluded that the current approach to risk assessment is fundamentally flawed because it is based on setting an exposure threshold that assumes that all the toxic properties of an agent have been identified and quantified.³⁶ However, because of the complexity of the analysis, citizens frequently find they are on less than

equal footing with industry groups who are paying their own consultants to complete the risk assessment.

Generally, citizens and grassroots organizations do not have access to the technical expertise that is required to understand risk assessment data. O'Brien noted the following:

If 300 citizens' organizations working on toxics issues were assembled in one place to describe their individual horror stories of involvement in or subjugation to the consequences of risk assessment, they could compile hundreds of tales. . . . Each story would be a testimonial to the near constant manipulations of risk assessments for the political purpose of demonstrating minimal harm or none from unnecessary use of toxic chemicals.^{37(p123)}

Although most nurses have only a superficial knowledge of environmental health policy, they are experts at understanding the core principles of advocacy. They also have had experiences where client interests are marginalized in what is supposed to represent a health agenda. As citizens and as nursing organizations, our profession can be a more powerful force in exposing power imbalances that prevent citizens' voices from being heard, taken seriously, and acknowledged.

Reframing environmental health issues from the perspective of the agent to that of the person and from the consequences of disease to their cause and prevention

To date, health providers have been responding to environmentally induced disease rather than developing systems to prevent its occurrence. To some extent the mismatch between exposure proliferation and disease recognition was inevitable, since it has always been easier to create and disseminate new products than to anticipate

the full range of health consequences (therapeutic as well as harmful) that can result from their use. Differences in susceptibility between the young and the old, and the well and ill, have further complicated scientists' abilities to understand, let alone predict, the full expression of health consequences from environmental exposures. The proliferation of untested chemicals is a major concern to citizens; a recent publication from the National Environmental Trust⁵ noted that the overwhelming majority of the 80,000 chemicals in use have not been subjected to adequate toxicology testing, and even fewer have been tested for developmental and neurologic effects. However, even for agents where harmful consequences have been documented for decades, or in some cases more than a century (eg, lead, mercury, asbestos), health care providers find that their efforts are disproportionately concentrated on outbreaks rather than prevention. The recent recognition that more than 200 people in Libby, Montana, died as a consequence of exposure to asbestos-tainted vermiculite provides evidence in support of this conclusion.¹⁰

Meaningful changes in the ways that clinicians practice environmental health must be predicated on efforts that reframe environmental health from a reactive to a proactive mode. When objective data addressing risk exist, they should be systematically analyzed. When a political decision is being made under the guise of data, the discussion needs to be reframed so that citizens understand why and how a decision is really being made. As Luke noted:

All too often the type and quantity of evidence needed to assess environmental risk is treated as purely scientific data secure on allegedly pure technical grounds, when, in fact, determining

the qualities of the toxicant often is a social act of political interpretation as much as, if not more than, it is a mechanical procedure for assaying the acceptability of risk.^{36(p240)}

Nurses can facilitate the process of re-framing by working with other disciplines to gather scientific evidence in a manner that encompasses the full range of human exposures and acknowledges, rather than dismisses, the sociopolitical context of environmental health decisions. Nurses also can ensure that citizens have continuing opportunities to engage the process and have their voices heard. In a discussion of the role of an informed citizenry on a proposed zinc-copper sulfide mine in Wisconsin, Gedicks noted that as the process evolved, citizens began to “shift the discussion from the issue of mine production, which leaves the state, to the issue of mine waste, which remains in the local community and may have long-term and serious effects on both

the environment and the health of local populations.”^{38(p264)}

Integrating distributive and strategic actions

The integration of distributive and strategic actions and their relationship to health and system outcomes are outlined in Fig 1. System outcomes that can be facilitated through comprehensive nursing actions include: (1) improvements in the quality and comprehensiveness of environmental health data, (2) enhanced environmental health capacity and technical expertise within nursing, (3) the potential for more targeted and scientifically sound responses to local environmental health problems, and (4) enhanced sensitivity and responsiveness to citizen-initiated concerns. These outcomes are a favorable byproduct of engaging the community in an ongoing dialogue about environmental health.

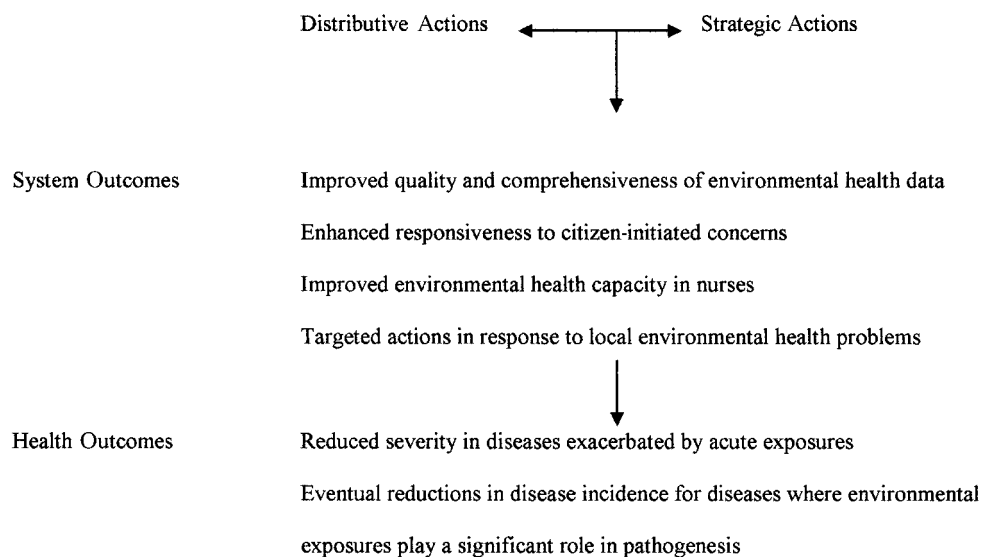


Fig 1. Upstream framework: Relationship of distributive and strategic actions to (1) system outcomes and (2) health outcomes.

Systematic improvements in the way that environmental health data are collected and understood will yield short- and long-term health benefits to the population. Over the short haul there is the potential to reduce the severity of conditions that are exacerbated by acute exposures. Asthma is the most obvious example; when asthma becomes a reportable condition (akin to cancers), the potential will exist to examine geographic and temporal trends in incidence (eg, Are there increased levels of asthma adjacent to point-source emitters?). Once this infrastructure is in place, the possibility exists to reduce severity at a population level through site-specific interventions. The challenges of impacting long-latency conditions, such as neurologic conditions, chronic respiratory disease, and cancers, are formidable, and they will not be overcome by a single program or initiative, even one that is implemented nationwide. However, the potential to reduce disease does exist through ongoing improvements in environmental health vigilance. Counting (diseases and exposures) and naming (potential health threats) are the first steps in differentiating between types of environmental health threats and enacting plans to reduce such threats.

THE ROAD AHEAD

The road ahead is not an easy one. Nurses who choose to strengthen their own environmental health capacity will need to venture into scientific papers addressing toxicology, quantitative risk assessment, and risk communication. They will need to know what diseases are reportable conditions and, more important, challenge the system to examine why other diseases are not reported. They will need to work toward incremental changes in nursing practice through small and seemingly mundane actions such as revisions in medical records and toward system change through involvement in national policy and research initiatives. They will need to design and implement prevention programs for communities whose concerns have been marginalized under the guise of economic progress, while simultaneously seeking adequate financial support for such programs. The challenges are no more than rethinking the boundaries among the concepts of prevention, cause and cure, and the loosely knit network of health systems that count diseases. The rewards are no less than the design of health actions that embrace the complexity of environmental health science, the holism of nursing practice, and the voice of our clients.

REFERENCES

1. Olden K, Guthrie J, Newton S. A bold new direction for environmental health research. *Am J Public Health*. 2001;91:1964–1967.
2. Hoyert DL, Arias E, Smith BL, Murphy SL, Kochanek KD. Deaths: final data for 1999. National Vital Statistics Reports. Hyattsville, MD: National Center for Health Statistics; 2001;48(8):27–28.
3. Pope AM, Synder MA, Mood LH, eds. *Nursing, Health & the Environment*. Washington, DC: National Academy Press; 1995.
4. Smith KR, Corvalan CF, Kjellstrom T. How much global ill health is attributable to environmental factors? *Epidemiology*. 1999;10:573–584.
5. National Environmental Trust, Physicians for Social Responsibility, Learning Disabilities Association of America. *Polluting Our Future: Chemical Pollution in the U.S. That Affects Child Development and Learning*. Washington, DC; 2000.
6. Clark NM, Brown RW, Parker E, et al. Childhood asthma. *Environ Health Perspect*. 1999;107:421–429.

7. Rahman Q, Nettesheim P, Smith KR, Seth PK, Selkirk J. International conference on environmental and occupational lung disease. *Environ Health Perspect.* 2001;109:425–431.
8. Lichtenstein P, Holm NV, Verkasalo PK, et al. Environmental and heritable factors in the causation of cancer. *N Engl J Med.* 2000;343:78–85.
9. Centers for Disease Control and Prevention, National Center for Environmental Health. *National Report on Human Exposure to Environmental Chemicals.* Atlanta, GA; 2001.
10. Pew Environmental Health Commission. *America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network.* Baltimore, MD; 2000.
11. US Environmental Protection Agency. About the Toxics Release Inventory (TRI) data collection. <http://www.epa.gov/tri/triwww.htm>. Accessed October 29, 2001.
12. Medlin J. Sister study hopes to answer breast cancer questions. *Environ Health Perspect.* 2001;109:A368–A369.
13. Schneider D, Freeman N. *Children's Environmental Health: Reducing Risk in a Dangerous World.* Washington, DC: American Public Health Association; 2000.
14. Weaver JT. The child is the father of the man: paediatricians should be more interested in adult disease. *Clin Med.* 2001;1:38–43.
15. Hopkins GM. *Poems of Gerald Manley Hopkins.* London: Humphrey Milford; 1918.
16. McKinlay J. A case for refocusing upstream—the political economy of illness. In: Enelow A, et al, eds. *Behavioral Aspects of Prevention.* Houston, TX: American Heart Association; 1975.
17. McKinlay JB, Marceau LD. To boldly go . . . *Am J Public Health.* 2000;90:25–33.
18. McKinlay JB, Marceau LD. Upstream healthy public policy: lessons from the battle of tobacco. *Int J Health Serv.* 2000;30:49–69.
19. Butterfield PG. Thinking upstream: nurturing a conceptual understanding of the societal context of health behavior. *Adv Nurs Sci.* 1990;12:1–8.
20. Butterfield PG. Thinking upstream: conceptualizing health from a population perspective. In: Swanson JM, Nies MA, eds. *Community Health Nursing.* 2nd ed. Philadelphia: W.B. Saunders; 1997:69–74.
21. Butterfield P. Recovering a lost legacy: nurses' leadership in environmental health. *J Nurs Educ.* 2000;39:9. Editorial.
22. Hicks J. More history from the Will Durants: spray old team does it again. *Life.* 1963;55(16):89, 92.
23. Bellack JP, Mucham C, Hainer A, Graber DR, Holmes D. Environmental health competencies: a survey of US nurse practitioner programs. *J Nurs Educ.* 1996;35(2):74–81.
24. Tiedje LB, Wood J. Sensitizing nurses for a changing environmental health role. *Public Health Nurs.* 1995;12:359–365.
25. Coss C, Lillian D. Wald, *Progressive Activist.* New York: The Feminist Press; 1989.
26. Rogers B. Expanding horizons: integrating environmental health into occupational health nursing. *AAOHN J.* 1998;46:9–13.
27. Salazar MK, Primomo J. Taking the lead in environmental health: defining a model for practice. *AAOHN J.* 1994;42:317–324.
28. Chopoorian T. Reconceptualizing the environment. In: Moccia P, ed. *New Approaches to Theory Development.* New York: National League for Nursing; 1986. Publication 15-1992.
29. Melamed A. Nurses attack hidden dangers of health care. *Am Nurs.* Nov/Dec 2000, <http://www.ana.org/tan/novdec00/pollutio.htm>. Accessed January 8, 2002.
30. Health care without harm. <http://www.noharm.org>. Accessed December 18, 2001.
31. Marwick C. Medical facilities to focus on cleaner environment. *JAMA.* 1998;280:501–502.
32. Grady PA, Harden JT, Moritz P, Amende LM. Incorporating environmental sciences and nursing research: an NINR initiative. *Nurs Outlook.* 1997;45:73–75.
33. Dixon JK, Dixon JP. An integrative model for environmental health research. *Adv Nurs Sci.* 2002;24(3):43–57.
34. Shreffler MJ. An ecological view of the rural environment: levels of influence on access to health care. *Adv Nurs Sci.* 1996;18:48–59.
35. National Research Council. *Environmental Epidemiology: Use of the Grey Literature and Other Data in Environmental Epidemiology.* Washington, DC: National Academy Press; 1997.
36. Luke TW. Rethinking technoscience in a risk society: toxicity as textuality. In: Hofrichter R, ed. *Reclaiming the Environmental Debate: The Politics of Health in a Toxic Culture.* Cambridge, MA: MIT Press; 2000:239–254.
37. O'Brien MH. When harm is not necessary: risk assessment as diversion. In: Hofrichter R, ed. *Reclaiming the Environmental Debate: The Politics of Health in a Toxic Culture.* Cambridge, MA: MIT Press; 2000:114–134.
38. Gedicks A. Silencing the voice of the people: how mining companies subvert local opposition. In: Hofrichter R, ed. *Reclaiming the Environmental Debate: The Politics of Health in a Toxic Culture.* Cambridge, MA: MIT Press; 2000:258–273.