ENVIRONMENTAL HEALTH CLINICAL COMPETENCIES FOR FAMILY NURSE PRACTITIONERS

by

Valli Evenstar Stager

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Valli Evenstar Stager

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Patricia G. Butterfield, Ph.D., R.N. Patricia G. Butterfield 5.7.01
(Signature) (Date)

Approved for the Department of Nursing

Lea Acord, Ph.D., R.N.
Dean College of Nursing Lea Acord 5/19/01
(Signature) (Date)

Approved for the College of Graduate Studies

Bruce McLeod, Ph.D.
Graduate Dean Bruce R. McLeod 6-1-01
(Signature) (Date)

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Date 5-7-01

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ABSTRACT

The purpose of this project was to propose a set of environmental health clinical practice competencies for family nurse practitioners (FNPs). FNPs provide primary health care across the life span. Primary health care encompasses a basic level of health care that considers a larger sociopolitical context of health care delivery, exemplified by a commitment to access, affordability, and an emphasis on vulnerable populations. A strong relationship exists between the environment and health. To provide comprehensive care, a FNP's responsibilities should include basic clinical competencies in environmental health.

Bronfenbrenner's (1977) framework provided the conceptual foundation for the project. Within this context, the environment is viewed as an ecological system with the nested levels of microsystem, mesosystem, exosystem, and macrosystem. All the systems influence the individual or population. The project method involved interviews with seven leading experts in environmental health and eight practicing FNPs describing environmental health in current and ideal practice. Areas of convergence and divergence were derived from data themes. From the areas of convergence, seven clinical competencies were proposed:

1. The FNP should conduct a careful, systemic assessment that elicits both exposure and disease data pertaining to environmental health.
2. The FNP should identify and treat respiratory disorders and implement risk reduction strategies for environmentally related respiratory conditions.
3. The FNP should be able to identify agents and health consequences associated with local environmental hazards.
4. The FNP should understand the relationships between poverty and environmental health, as well as clinical topics addressing occupational health, effects of pesticide exposure, water quality, and lead poisoning.
5. The FNP should address pediatric environmental health, paying special attention to the child's unique susceptibilities and environments.
6. The FNP should locate local environmental health experts for both collaboration and referrals.
7. The FNP should proficiently access scientific and clinical information addressing environmental health topics.

Four areas of divergence addressed the areas of policy, poverty, risk, and water quality. Strategies for facilitating the FNP's knowledge of environmental health problems are discussed. The strategies include incorporating environmental health into FNP education programs, increasing environmental health in continuing education, and using quick reference tools in practice.

CHAPTER 1

INTRODUCTION

The six billion people on earth live inextricably connected to the environment. People affect multiple and interrelated sets of environments, often altered for their perceived benefit. Once thought harmless, many of the products of industrial progress are toxic to the ecosystems of the earth. Environmental manipulations often result in harmful situations. Pollution constantly threatens the optimal physical balance of clean water, air, and land (Loefler, 1997). Scientific knowledge addressing the intersections between the environment and health has advanced within the past few decades. As health care professionals, nurses promote the health and safety of all people and nursing plays an important role in environmental health. Since the work of Florence Nightingale 150 years ago, nursing remains concerned with the effects of environment on human health. More than ever, nurses are well positioned to prevent and minimize environmental health hazards (Pope, Snyder, & Mood, 1995).

Nursing as a profession has grown, evolving over time into a myriad of clinical specialties. Originally created as a physician extender, the nurse practitioner role was formed in response to the shortage of physicians in impoverished and rural areas (Koch, Pazaki, & Campbell, 1992). Nurse practitioners (NPs) combine a degree as a professional nurse with advanced education and clinical competencies required for the delivery of primary health care. Family nurse practitioners (FNPs) represent a specialty group of NPs who provide primary health care services to individuals, families, and communities in

independent as well as collaborative practice with physicians and other health care professionals. Primary health care is a basic level of health care provided within the context of programs directed toward the promotion of health, early diagnosis of disease or disability, and prevention of disease (Anderson, 1998). Primary health care considers the larger sociopolitical context of health care delivery with a commitment to access, equity, affordability, and an emphasis on vulnerable populations (Barnes et al., 1995). Because of this scope of practice, FNPs may address environmental health issues and thus should be clinically competent in the area of environmental health.

Historical Background of Nursing and Environmental Health

Perspectives from Florence Nightingale

> There are five essential points in securing the health of houses:
>
> 1. Pure air.
> 2. Pure water.
> 3. Efficient drainage.
> 4. Cleanliness.
> 5. Light.
>
> Without these, no house can be healthy.
>
> -Florence Nightingale, 1860 (1969, p. 24).

Florence Nightingale, the matriarch of modern nursing, emphasized an environmental impact on human health. The 'essential points' remain as important and applicable today as 150 years ago. Nightingale's experiences in the Crimean War provided an education in addressing environmental problems such as lack of sanitation, the presence of filth, patient exposure to the elements, infestations, and opportunistic diseases (Tomey & Alligood, 1998). As the first nurse statistician, Florence Nightingale recorded her experiences, noting the relationship between the health of the environment and the health

of her patients. Her philosophy of environmental health provided the theoretical underpinning for many nursing schools, hospitals, and many nurse theorists (Tomey & Alligood, 1998).

Florence Nightingale explicitly described the health effects of ventilation, warmth, light, diet, cleanliness, and noise. Society today faces new environmental health issues such as nuclear waste, but contaminated water and air quality continue as problems for many U.S. communities. Florence Nightingale included societal conditions in her critique of environmental impact. She believed that the 'sick poor' would benefit from environmental improvements that focused on both their bodies and minds and that nurses were instrumental in changing the social status of the poor through improvements in living conditions (Tomey & Alligood, 1998). Within a historical context of environment, Florence Nightingale's recommendations were visionary but fall short of providing a mandate for environmental health by today's standards (Butterfield, 2000). By integrating primary health care, occupational safety, health education, and sociopolitical policy, public health nurses added more depth to the concept of environmental health for all people.

Public Health

Public health nurses held the front line of the great U.S. public health achievements of the past century. Lillian Wald, the founder of modern public health nursing, advocated for sanitation and sewage disposal laws, established a program to provide safe milk, and started fresh air camps for inner city children (Gerber & McGuire, 1999). Her commitment to raising the standard of living for the immigrant poor continued

the Nightingale philosophy of a change in health through environmental attention. Mary Breckenridge, the founder of the Frontier Nursing Service, also emphasized principles of environmental health. She recognized the importance of clean water sources and planned a hospital with consideration to clean water, air, light, and a reduction in noise pollution (Gerber & McGuire, 1999). As a public health nurse she taught simple methods of environmental health and helped to reduce infant mortality.

When the focus of nursing shifted in the early 1900s from community based to hospital based, the importance of a healthy environment was set aside for technological progress. The environment as a primary determinant of health became something separate from the usual practice of nursing rather than integral to its mission (Pope, Snyder, & Mood, 1995). Although nurses remained a part of community based health care, an emphasis on environmental health did not become popular again until the 1990's when many problems became too large to ignore.

Environmental Health Overview

Definitions

Environmental health is defined as freedom from illness or injury related to exposure to toxic agents and other environmental conditions that are potentially detrimental to human health (Pope, Snyder, & Mood, 1995). Environmental hazards fall into four generally accepted classifications: chemical (e.g. cyanide), physical (e.g. noise), biological (e.g. parasites), and psychosocial (e.g. violence). Environmental dangers may overlap between health and social issues. A toxic substance may interact with another substance in a synergistic manner to produce a heightened toxicity. A chemically

sensitive person may react to a substance that appears not to affect most people. The fluid conceptual boundaries of environmental health may expand or narrow as social priorities change and scientific knowledge increases (Pope et al., 1995). Most environmental hazards affect human health and occur in the home, workplace, community, and furthest reaches of the globe.

Health Care Issues

Recently changing perspectives generated an interest in the impact of a toxic environment on an individual's health. Family nurse practitioners often provide the first contact point in the health care system. Because FNP practice encompasses care of the client throughout the life span, their practice should include environmental health issues for children and adults.

Threats to the General Population. Water, air, and soil problems present the most potentially hazardous problems for an entire population. Safe drinking water is a significant issue due to threats from chemical and biological contamination. Parasites or human wastes directly contaminate drinking water. Pesticide run off pollutes waterways. The accumulation of pesticide residues on produce and chemicals in fish and seafood result in well documented health effects. Significantly contaminated, one fourth of all rivers, lakes, and streams in the U. S. cannot support safe public uses (Pope et al., 1995). Eating one fish from contaminated water is tantamount to drinking 1000 gallons of that water. Aquifers from which much of the U.S. draws its drinking water are shrinking, making them increasingly vulnerable to toxic contamination. Lead exposure can occur through drinking water, especially in homes that have lead plumbing or lead soldered

pipes. Industrial solvents may also appear in private and public drinking water. It is estimated that up to 25% of the nation's water supplies have detectable levels of tetrachloroethylene (ATSDR, 1992). Nitrates commonly contaminate rural shallow wells and pose a risk of methemoglobinemia to infants (ATSDR, 1992). Swimming in contaminated lakes and waterways can cause harmful exposures.

Air pollution, indoor and outdoor, presents another potential health threat. Fifty percent of the United States population lives in areas where the outdoor air does not meet Environmental Protection Agency standards for contaminants such as ozone, nitrogen dioxide, sulfur dioxide, and lead (Pope et al., 1995). The recent phenomenon of 'sick building syndrome' calls into question whether infrastructure receives adequate ventilation. Lack of proper ventilation and poor air quality can cause a variety of debilitating respiratory diseases including asthma and lung cancer. Environmental tobacco smoke is a mixture of over 4700 compounds and the smoke that comes off a smoldering cigarette contains more carcinogens than inhaled smoke (ATSDR, 1992). If not properly maintained, wood stoves emit harmful substances such as carbon monoxide, nitrogen, particulates, and hydrocarbons. Gas ranges may produce nitrogen oxide, a respiratory irritant. Building materials such as particle board, insulation, carpet adhesives, and mattresses contain formaldehyde that can volatize and cause nausea, dermatitis, and airway irritation (ATSDR, 1992). Asbestos, originally used to insulate, becomes dangerous when it gets old, frays, and releases into the air. Asbestos inhalation is linked to lung cancer, asbestosis, and mesothelioma. Smoking cigarettes, in addition to asbestos inhalation, increases the risk of cancer by an order of magnitude above smoking or asbestos exposure alone (ATSDR, 1992). A decay product of uranium, radon is a

colorless, odorless gas that breaks down and attaches to particulate. When inhaled, asbestos injures bronchial cells which can cause lung cancer (ATSDR, 1992).

The toxic effects of chemicals, heavy metals, hazardous waste, and spent fuels may play a role in the etiology of many cancers (Steingraber, 2000). The manufacturing of everyday products uses extremely toxic chemicals such as benzene, cadmium, carbon tetrachloride, and chromium oxide. The chemicals may release into the air, soil, and water or reside on the fashioned product. Much of the industrialized world spends billions of dollars dealing with hazardous waste but little attention is paid to the larger exposures to toxic chemicals in fuel and consumer products (Smith, 2000). One in four Americans lives within four miles of a Superfund site (Pope et al., 1995). The lowest estimate of cancer deaths attributed to environmental causes is two percent, but may be much higher (Harvard Center for Cancer Prevention, 1996).

Common household products such as cleansers, paint thinners, adhesive removers, air fresheners, moth crystals, and toilet bowl deodorizers may contain one or more of the following: chlorinated hydrocarbons, methylene chloride, and paradichlorobenzene (ATSDR, 1992). Cumulative use of these products can have significant health effects. Lead poisoning continues to be a pervasive problem in the U.S. Homes built before 1950 may have paint that contains very high levels of lead. The ceramic glaze used in imported pottery may contain lead that when leached by acidic foods, can be ingested (ATSDR, 1992). Recreational hazards exist especially for those working in arts and crafts, exposing people to silica, talc, solvents, and cadmium (ATSDR, 1992). Some clays contain asbestos like fibers. Toxic materials may be encountered in making stained glass, jewelry, woodworking, and oil and airbrush

painting (ATSDR, 1992). The Agency for Toxic Substances and Disease Registry established a list of priority health conditions associated with exposure to hazardous substances. The conditions include birth defects, reproductive disorders, cancer, immune dysfunction, kidney and liver problems, respiratory diseases, and neurotoxic disorders (Pope et al., 1995). On a larger scale, global environmental hazards such as warming trends, atmospheric ozone depletion, and ultraviolet exposure affect the range and magnitude of environmental exposures. The global, epidemic environmental hazard of violence exists in the home, community, and workplace (Pope et al., 1995).

The Pew Environmental Health Commission at the Johns Hopkins School of Public Health recently released a report charging that the U.S. faces an environmental health information gap. The commission proposes a network to track chronic diseases and their possible links to environmental exposures (Pew Environmental Health Commission, 2000). Components of the network would include baseline tracking of priority diseases such as asthma, birth defects, and neurological diseases, monitoring of environmental health crises, developing rapid response capability to investigate outbreaks, and supporting community interests and scientific research.

Toxic conditions in the air, soil, and water pose a threat to public health but so does a toxic culture. The social arrangements that encourage and excuse the deterioration of the environment and human health make communities unhealthy, producing a toxic culture (Hofrichter, 2000). Examples of toxic culture include socioeconomic factors such as tolerance for economic blight, dangerous technologies, substandard housing, chronic stress, and exploitative working conditions.

Pediatric Environmental Health. A 1997 Presidential Executive Order declared pediatric environmental health a health care priority and one of the most important issues of the new millennium (Shannon, 2000). Proportionally, children ingest 7-15 times more fresh produce and water than adults, magnifying their exposure to pesticides and waterborne substances. An immature renal system limits metabolism and excretion of certain toxins and an under-developed blood brain barrier increases direct exposure to the central nervous system. Children's higher metabolisms affect the absorption of toxicants, making them uniquely susceptible to environmental hazards (Pope et al., 1995). In addition, their smaller stature puts them closer to the floor where many toxic substances concentrate and are easily placed in the mouth. Exposure to hazards causes problems unique to children such as growth and development difficulties and greater susceptibility to cell mutation due to increased cell proliferation during growth. Environmental issues for children usually appear in the home such as passive tobacco smoke, radon, pesticides, carbon monoxide, air borne particulate, natural gas, and chemicals released from synthetic materials. The incidence of childhood asthma rose sharply in the last 30 years, paralleling an increase in air pollution (Pope et al., 1995). Of special concern is lead exposure and toxicity, which can cause irreversible deficits in attention and neurobehavioral function. Playground equipment can be potentially hazardous to children. Wooden structures that have not been treated with protective sealants may allow children to have dermal contact with harmful wood preservatives such as pentachlorophenol, creosote, and arsenic (ATSDR, 1992).

Women's Environmental Health. The Institutes of Medicine (IOM) has identified gender differences in susceptibility to environmental factors. Women's susceptibility to toxic agents increases because they typically spend more time in their homes and neighborhood environments than men (Hatch, 2000). This factor potentially increases their exposure to indoor and outdoor pesticides, pollution, and ultraviolet radiation. Contextual effects of neighborhood environments such as poverty and violence impact women more than men. In addition, women have more body fat and store more fat-soluble toxic material (e.g. dioxin) than men, even when both are exposed to the same amount (Hatch, 2000). Variable levels of hormones during a woman's life may influence susceptibility to environmental agents because hormones are responsible for greater immunoreactivity and consequently neuroendocrine and autoimmune disease. Limited data exists on the impact of poverty, illiteracy, and gender bias on women and environmental exposures. The failure to recognize and protect women's environment in economic policy and planning may lead to disease for women and their children (Kettel, 1996).

Occupational Health. The workplace presents numerous environmental hazards and exposures. Well-documented workplace injuries and fatalities provide examples of adverse effects of the environment on health (Pope et al., 1995). The establishment of the Occupational Health and Safety Administration (OSHA) in 1970 led to greater protection of worker health in the U.S. However, workers face increasingly complex environmental accidents and hazards. Working with low levels of carcinogens can cause illness and disability. Workers who manufacture polyvinyl chloride are exposed to high levels of

carcinogenic toxins (Steingraber, 2000). Occupations such as radiator repair, construction, metals recycling, battery manufacturing, smelting, and pigment formulation all expose workers to high levels of lead (ATSDR, 1992). Epidemiologic studies provide evidence of synergism or potentiation between home and work site exposures. For example, garden nursery workers may face additional pesticide exposures through gardening hobbies and mechanics may absorb lead in both professional and recreational activities.

Environmental Justice

The more poor the population, the greater the exposure to harmful conditions such as violence, overcrowding, and pollution (Gerber & McGuire, 1999). The environmental justice movement arose from historical findings which show that industrial plants, waste facilities, and other potential polluters have been sited more often in poorer than affluent communities. Environmental justice seeks to ensure that the negative effects of pollution do not disproportionately burden any particular part of the population. Environmental benefits may coincide with economic benefits. Toxic sites called 'brownfields' not only expose neighborhood residents to environmental and public health hazards but deter or prohibit economic redevelopment (Shutkin & Mares, 2000).

The IOM acknowledges that environmental hazards excessively encumber poor and minority populations. The IOM called for more research that could help policy makers weigh the possible environmental risks of a facility against the economic benefits (Institutes of Medicine & Health Sciences Policy Program, 1999). Communities exposed to higher levels of pollutants than others are not well equipped to deal with the problem

because of limited involvement in the political process. The IOM (1999) recommends action toward environmental justice in four key areas: public health, research, education, and health policy. Public health officials should apply principles of risk assessment to identify the source of problems and design and implement interventions. Researchers should acknowledge environmental justice and improve the relevant data and science base. Educators should work to improve the understanding of environmental justice issues among community residents and health professionals. Policy makers should take environmental justice concerns seriously, remaining attentive to potential hazards and involving the affected communities in the decision-making process (Institutes of Medicine & Health Sciences Policy Program, 1999).

The environmental justice movement places new emphasis on the synergistic and cumulative effects of exposure to multiple toxins under conditions of poor health, poverty, and the stresses of other social inequities (Hofrichter, 2000). The past century brought public and scientific recognition of the relationships among deteriorating ecological systems, social conditions, inequality, and patterns of human health. The roots of ill health may lie in environmental issues such as poverty, racism, and unequal social arrangements (Hofrichter, 2000).

Problem Statement

Health professionals should assess, prevent, and mitigate the impact of environmental hazards on the health of the population (Pew Health Professions Commission, 1998). Many of the health problems caused by the environment require early diagnosis and treatment for the best possible outcome, yet many health care

professionals may lack the ability to recognize an environmentally induced disease. Primary health care nurse practitioners must possess the knowledge and skills for effectively addressing environmental health as a component of their practice (Bellack, Musham, Hainer, Graber, & Holmes, 1996).

Standards of practice should guide a profession and nursing is no exception. Presently, no standards of practice exist for environmental health nursing, although several nursing associations and councils have released position statements (Gerber & McGuire, 1999). Occupational health nurses routinely utilize environmental health concepts in their practice and added the term 'environmental' to their title (Rogers & Cox, 1998). The occupational health nurse ensures the continued safety of the work place environment and health of workers. Major components of their specialty ensure the continued health and safety of a broader population and remain useful for the FNP. Occupational and environmental health practice emphasizes health promotion and disease prevention to keep the working population healthy (Anonymous, 1999).

A recent increase in related literature and national initiatives providing direction to act on behalf of individual and population health illustrates a renewed interest in nursing's role in environmental health (Butterfield, 2000). Much of the literature focuses on recommendations for registered nurses, which although extremely useful for the FNP, may fall short of an expanded scope of practice. The lack of literature concerning NPs and environmental health speaks to several phenomena. The relatively new role of the NP emerged in the last 35 years. When practicing primary health care, FNPs may already involve an awareness of environmental health by assessing for workplace or home exposures to toxic substances. Bellack et al. (1996) studied the inclusion of

environmental health issues in United States NP programs, concluding that although nursing graduate programs place importance on environmental health, those programs often lack any content about environmental health. Medical schools recently incorporated environmental health into their programs and clinical competency recommendations exist for primary health care physicians (Pope & Rall, 1995). Nurse practitioner programs should prepare graduates with the competencies needed to respond effectively to environmental health issues and problems of individuals and communities (Bellack et al., 1996). Most U.S. NP program directors see a need for greater emphasis on environmental health in their programs. Barriers cited include crowded curricula and lack of faculty training in the area of environmental health (Bellack et al., 1996). Approaching the problem in terms of adding on new classes is not feasible for most programs. Instead, present recommendations call for the incorporation of environmental health content into present university curricula.

This project focuses on the specific environmental health content and clinical practice competencies for FNPs. The FNP should promote, protect, and improve the health of the community. Clinical competencies in environmental health assist with accomplishment of these expectations.

Purpose

The purpose of this project was to propose a set of empirically based environmental health practice competencies for FNPs. To achieve this purpose, environmental health data from leading experts in environmental health and practicing FNPs was systematically analyzed. The project derived clinical practice competencies

from areas of convergence and divergence between the FNPs and environmental health experts.

Conceptual Framework

Ecology

An ecological perspective encompasses the relationship between all living things and their respective environments. The ecological perspective assumes that everything connects to everything else. Ecology evolved from the study of sociology and biology. Since Darwin's 'web of life,' ecology is founded upon a highly complex set of interrelationships (Salazar & Primomo, 1994). Ecological models, when used within the allied health literature, address broad multidimensional environmental characteristics. They reflect the view that the environment, rather than the individual, is the subject of change (Kleffel, 1991). Ecological models assume that appropriate changes in the environment produce changes in individuals, but the support of individuals remains essential for implementing environmental changes. Health education interventions may target any level of an ecological model. The more levels involved, the more effective the results (Kleffel, 1991). The concept of ecology frames and defines environmental health in this project. The ecological systems approach appropriately examines complex environmental health problems resulting from multiple factors in the environment. An environmental hazard is complex, involving physical, cultural, social, political, and economic factors, all interacting in a variety of contexts (Salazar & Primomo, 1994). The environment is composed of dynamic, interrelated, concentric circles of involvement.

Bronfenbrenner's Model of Ecology

Bronfenbrenner's model of the ecology of human development focuses on both individual behavior and environmental determinants (Bronfenbrenner, 1977). Although Bronfenbrenner created the framework for human development, it remains appropriate in the study of environmental health. The application of this framework includes studies that describe and delineate strategies for child maltreatment, disease prevention and health promotion in maternal and child health, stressors in the childbearing family, and health promotion programs (Salazar & Primomo, 1994). Bronfenbrenner's framework describes the environment as an ecological system with the nested levels of microsystem, mesosystem, exosystem, and macrosystem (Bronfenbrenner, 1977). The systems represent all levels of influence upon the individual or population. Each system is dynamic and changes are constant with energy and information exchange. Input in the form of energy, matter, and information pass through the boundaries separating the levels of systems.

Microsystem. The microsystem forms the complex relations between the individual and environment in an immediate setting containing that person (Bronfenbrenner, 1977). A setting is a place with particular physical features in which individuals engage in particular activities and roles for particular periods. The factors of place, time, physical features, activity, individuals, and role constitute the elements of a setting. Examples of this level include the home, workplace, or school. Environmental hazards affecting the microsystem include those found in the home or work such as radon, lead, and asbestos.

Mesosystem. The mesosystem comprises the interrelations among major settings containing the individual at a particular point in their life (Bronfenbrenner, 1977). The mesosystem is a combination of interacting microsystems. Examples of the mesosystem are a family, school, church, and social group with all the interactions among them. Environmental hazards within the mesosystem include those that may be transmitted to individuals through involvement in several different microsystems. The concept of mesosystem explains the transmission of an airborne infectious disease from a house to a school to a church and then on to many homes.

Exosystem. The exosystem makes up an extension of the mesosystem that embraces other specific social structures, both formal and informal, that do not themselves contain the individual (Bronfenbrenner, 1977). The exosystem involves the person's immediate setting and influences, limits, or determines what goes on within that system. Major institutions of society are included as they operate at a concrete local level. The exosystem is the total environment of work, neighborhood, the mass media, governmental agencies (local, state, and national), the distribution of goods and services, communication and transportation facilities, and informal social networks. Hazards of this system may be a lack of appropriate health services, erroneous or misleading information about a problem or issue, and the implementation or lack of policy.

Macrosystem. The macrosystem refers to overarching institutional patterns of culture that exist and set the pattern for the structures and activities occurring at the concrete level (Bronfenbrenner, 1977). Most macrosystems are informal, implicit, and ubiquitous, carried unknowingly in the minds of society as ideology and manifested

through custom and practice. Examples include the abstract economic, social, educational, legal, and political systems of which the other three system levels are tangible examples. Customs, cultural norms, and economic or political power make up the macrosystem. Macrosystems carry information and ideology that endow meaning and motivation to particular agencies, social networks, roles, and activities. Although infrequently discussed, environmental issues in this system are extremely important. For example, the macrosystem represents society's acceptance or rejection of tobacco smoke in buildings and policy then created as a result of a change in society's norms. The macrosystem is similar to the underpinnings of 'toxic culture,' which focus on the often overlooked yet very influential components of culture, such as logic, ideology, myths, symbols, language, concepts, rituals, and valuation processes (Hofrichter, 2000). These components heavily influence the other systems comprising the environment of an individual or community.

Application of Bronfenbrenner's Model In Primary Health Care

FNPs inevitably face clients experiencing environmentally induced health problems and an ecological framework aids in the examination of problems on many different levels. This broad sense of a client's environment leads to a deeper understanding of that client, guiding assessment, diagnosis, and treatment options in a holistic manner. The following example clarifies and explains the ecological framework.

Secondhand smoke is an environmental health problem, especially for children. Every year in the U.S. secondhand smoke aggravates one million cases of asthma, causes 300,000 lower respiratory infections, one million ear infections, and 2,700 deaths from

sudden infant death syndrome in children (U.S. Environmental Protection Agency, 1992; National Heart, Lung, and Blood Institute, 1998). A child's exposure to secondhand smoke usually occurs in the home (microsystem). People or places within the family's social or recreational network (mesosystem) may also expose the child to smoke and reinforce a positive smoking message. In addition, institutional systems (exosystem) such as the media actively promote smoking to children. Lack of local policy restrictions against smoking in public places and under funded local agencies ineffectively prevents children from smoking. Within the largest context (macrosystem), smoking as culturally acceptable as well as social conditions such as poverty, contribute to a child's exposure to secondhand smoke. A society's larger political context impacts social policy concerning smoking and the economic value of cigarettes drives companies, in turn, to influence the political process.

This example illustrates how merely counseling a child about the dangers of smoking falls short of adequately preventing exposure to smoke. The example reflects the need for FNPs to remain cognizant of the many factors that affect environmental health issues. Any health care problem fits in Bronfenbrenner's model but it is particularly well suited to those with an environmental etiology. Using Bronfenbrenner's conceptual framework as an underpinning for both health problems and this professional project ensures consideration for most contributing factors to environmentally induced disease. Limiting the discussion to the existence of specific toxic substances fails to provide an adequate context that will lead to an in depth understanding of the complexity of and relationships between environmental health problems.

CHAPTER 2

LITERATURE REVIEW

Although Florence Nightingale described a relationship between the environment and the patient, environment is a term only recently brought to the forefront of nursing literature. To form this project's foundation, the literature review focuses on the area of environmental health and its relationship to nursing, medicine, education, and research. The review of literature is divided into two sections. The first section summarizes papers addressing modern nursing's role in environmental health. The second section examines the literature of national workgroups and consensus groups pertaining to nursing, nursing research, and environmental health. The chapter finishes with publications regarding environmental health in the realm of primary health care.

Modern Nursing's Perspectives Regarding Environmental Health

Chopoorian (1986) began the trend of renewed interest in environmental health nursing. Until then, the emphasis on environment primarily focused on institutional environments (e.g. hospitals and nursing homes) to which people adapt or conform. Overall, nursing theories minimized the role of environment and disregarded the institutional environment, failing to explain violent or unacceptable environments. Chopoorian proposed that nursing lacked a broad environment consciousness that contributed to the peripheral role of nursing in social, economic, and political affairs. Nurses needed to look at the environment of human experience and everyday life, for the

origin and perpetuation of problems that affected both themselves and their clients. She issued a challenge to nurses to broaden their concept of the environment from the client-oriented, to a social, economic, and political context. Chopoorian recognized the importance of primary health care and nurses were encouraged to turn their attention to the conditions that control, influence, and produce health or illness in human beings.

Health care professionals traditionally treat, rather than prevent, disease related to the environment. This 'downstream' approach towards health care involves treating the patient, ignoring what first made them sick. Butterfield (1990) proposed using the term 'thinking upstream,' as a re-conceptualization of nursing practice. Upstream care focuses on modifying the economic, political, and environmental contributors to poor health throughout the world. For nurses to enact social change they should be provided frameworks and theoretical perspectives that put emphasis on the social, economic, and political forces (Butterfield, 1990). This framework for prevention draws on connections between individual health, national-level policy making, and based on the premise that changes in the health of a society will influence the health of the individual.

Kleffel (1991) proposed that nurses remain cognizant of environment as a determinant of illness and focus interventions on primary health care and changes in the environment. Kleffel discussed environmental health within the context of nursing theories, public health, and ecological models, and concluded that nursing must pay multidimensional attention to the environment. Kleffel also discussed ecofeminist theory as applied to nursing. She explained the similarities between feminist and ecological concerns as both are subjected to the same ambivalent behavior and dominance by a male-dominated society. As nursing incorporates feminist theory into nursing knowledge

and environmental concern becomes central to nursing practice, nurses should be doubly interconnected to environmental issues as women and nurses.

Salazar & Primomo (1994) proposed an ecological model for practice, encouraging nurses to take the lead in environmental health. The article emphasized historical and modern day examples of an increased awareness of environmental issues by society and nursing, summarizing that an ecological systems model is the most inclusive and logical for nursing practice. The model could serve as a means to guide the development of primary, secondary, and tertiary preventive strategies to address environmental health problems.

Kleffel (1996), in a later work, explored environmental health from three different paradigms; egocentric, homocentric, and ecocentric, relating them to nursing. She deemed existing environmental paradigms adequate for encompassing the 'bigger picture.' The egocentric approach is a mechanistic paradigm, assuming that what is best for the individual is best for society with a focus on liberty, rights, and independent action of the individual (Kleffel, 1996). The individual is the focus of change in the egocentric approach. The homocentric paradigm is utilitarian and grounded at the social level (Kleffel, 1996). Social justice, rather than individual progress, is the essential value of homocentrism. The perceived norms of health care and society include egocentric and homocentric perspectives. The ecocentric approach roots itself in holistic theory, with the basic assumption that everything is connected and the whole is greater than the sum of its parts. Kleffel (1996) proposed that moving to the ecocentric paradigm could encourage nurses to notice global environmental problems that affect the health of everything that

exists. Ecocentrism exists in various cultures and is practiced when nurses think globally and act locally.

The ecological perspective provides a framework for more adequate explanations of the determinants of health and illness (Shreffler, 1996). Bronfenbrenner's framework reveals an impact on individual access to rural health care. The influences of each level are explored, especially on the outcome of access and possible solutions to promote better access. All the system levels effect each other and should be included in nursing research. The conclusions have broad implication for environmental awareness, especially community assessment.

National Workgroups and Consensus Groups Addressing Environmental Health

The National Institute of Nursing Research's (NINR) Environmental Health Sciences Work group convened in 1995. This panel identified gaps in the knowledge base of environmental health science and explored research gaps, opportunities, and challenges (Grady, Harden, Moritz, & Amende, 1997). The group discussed three broad concepts: target populations, target areas for clinical studies, and research infrastructure needs. The identification of a target or vulnerable population represents a challenge in environmental health as these populations have multiple environmental risk factors and knowledge deficits. The work group noted that study of long-term, delayed, and potentially generational health effects of environmental hazards requires new and innovative research strategies (Grady, Harden, Moritz, & Amende, 1997). Interdisciplinary and multidisciplinary partnerships are essential if nursing research is to

impact environmental challenges such as workplace hazards, contaminated surface water, and vulnerable populations such as pregnant women.

In 1995, the Agency for Toxic Substances and Disease Registry (ATSDR) began formation of the Environmental Health Nursing Initiative. This initiative recognizes the vital and broad role nursing professionals play in every area of the health arena to help protect the public's health (ATSDR, 2000). The initiative spans the nation with the goal of increasing the environmental health competencies of all nurses. The initiative provides a mandate that nursing school course curricula should include environmental health topics. The initiative also provides educational opportunities to practicing nurse professionals. The project promotes a holistic approach to health and the environment and a framework to advance all nurses in the U. S. in the environmental health arena (ATSDR, 2000).

The Pew Health Professions Commission released a major report concerning health care professionals. Specifically covered are strategies for improving practice to meet the needs of a new century (Pew Health Professions Commission, 1998). To succeed in the new century, health care professionals should learn how to balance individual needs with system and population constraints by revising current education, policy, and practice to meet the changed health care needs of the public. The Pew Commission defined twenty-one competencies that all health professionals should embrace and understand. The Commission recommended the following for all health professional groups:

1. Change professional training to meet the demands of the new health care system.
2. Ensure that the health profession workforce reflects the diversity of the nation's population.
3. Require interdisciplinary competence in all health professionals.
4. Continue to move education into ambulatory practice.
5. Encourage public service of all health professional students and graduates. (Pew Health Professions Commission, 1998, p. 28).

Many of the recommendations are highly applicable to FNP primary health care practice, with some of the 21 competencies for the twenty-first century addressing the scope of the FNP. The Pew Commission also listed proposals specific to advanced practice nursing. The recommendations contained details about program funding, practice standards, research, and an emphasis on primary health care.

The Institutes of Medicine (IOM) Committee on Enhancing Environmental Health Content in Nursing Practice presented their recommendations for registered nurses in practice, education, and research (Pope et al., 1995). The IOM outlines specific strategies for implementing these recommendations. For nursing practice, the recommendations were:

(1) Environmental health should be reemphasized in the scope of responsibilities for nursing practice.
(2) Resources to support environmental health content in nursing practice should be identified and made available.
(3) Nurses should participate as members and leaders in interdisciplinary teams that address environmental health problems.
(4) Communication should extend beyond counseling individual patients and families to facilitating the exchange of information on environmental hazards and community response.
(5) The concept of advocacy in nursing should be expanded to include advocacy on behalf of groups and communities, in addition to advocacy on behalf of individual patients and their families.
(6) Conduct research regarding the ethical implications of occupational and environmental health hazards and incorporate findings into curricula and practice (Pope et al., 1995, p. 10).

Recommendations for nursing education were:

> (1) Environmental health concepts should be incorporated into all levels of nursing education.
> (2) Environmental health content should be included in nursing licensure and certification exams.
> (3) Expertise in various environmental health disciplines should be included in the education of nurses.
> (4) Environmental health content should be an integral part of lifelong learning and continuing education for nurses.
> (5) Professional associations, public agencies, and private organizations should provide more resources and educational opportunities to enhance environmental health in nursing practice (Pope et al., 1995, p. 10-11).

Concerning graduate-nursing education, the preparation of advanced practice nurses provides an excellent opportunity for including environmental correlates of injury, disease, disability, and the management of acute and chronic illnesses. Education at the graduate level must provide the knowledge, skills, and competencies to prepare the advanced practice nurse to effectively incorporate environmental health assessment, risk management, referrals, and risk communication into practice (Pope et al., 1995). The IOM suggests changes in graduate nursing along with nursing competencies and content examples. The suggested competencies are the same as those put forth for all nurses as follows:

> All nurses should understand the scientific principles and underpinnings of the relationship between the health of individuals or populations, and the environment, including work environments. This understanding includes the basic mechanisms and pathways of exposure to environmental health hazards, basic prevention and control strategies, the interdisciplinary nature of effective interventions, and the role of research.
> All nurses should be able to successfully complete an environmental health history, recognize potential environmental hazards, sentinel illnesses, and make appropriate referrals for conditions with probable environmental etiologies. An essential component of this is the ability to access and provide information to patients and communities, and to locate referral services.

> All nurses should be able to demonstrate knowledge of the role of advocacy, ethics, and risk communication in patient care and community intervention with respect to the potential adverse effects of the environment on health.
> All nurses should understand the policy framework and major pieces of legislation and regulations related to environmental health (Pope et al., 1995, p. 62).

Environmental Health Recommendations Addressing Physicians

A Canadian study interviewed 214 rural and urban family practice physicians, asking them to describe environmental health problems encountered in practice and the differences between the environmental concerns of urban and rural populations (Sanborn & Scott, 1998). The physicians in both groups reported many patient questions about the health effects of environmental exposures. The physicians considered pregnant women, agricultural workers, and children important at-risk groups. Rural physicians reported concern about agricultural pesticide exposure. They also reported patient's fears about moldy hay. Urban physicians expressed different concerns about lead and exposure to fish caught in the Great Lakes. Both groups used similar sources of current environmental health information and all groups reported a lack of resources to meet professional and patient concerns about environmental health (Sanborn & Scott, 1998).

The IOM recommended competencies and curriculum content for primary health care physicians are similar to those recommended for registered nurses but with a focus on clinical care (Pope & Rall, 1995). Environmental medicine is prevention oriented and many of the most effective prevention activities occur outside the traditional clinical paradigm. The clinical encounter provides a unique opportunity for the clinician to practice prevention oriented primary health care (Pope & Rall, 1995). The IOM panel

noted that medical education lacks significant content in environmental health related issues. As of 1994, 66% of medical schools required, at most, six hours of study in occupational and environmental health. Practical barriers to physician involvement in environmental health include time constraints and lack of reimbursement for claims related to environmental health. Physicians should be able to identify environmentally related illnesses and refer patients appropriately for follow-up. According to Pope and Rall (1995), six, competency based learning objectives for physicians are as follows:

(1) Graduating medical students should understand the influence of the environment and environmental agents on human health based on knowledge of relevant epidemiologic, toxicologic, and exposure factors.
(2) Graduating medical students should be able to recognize the signs, symptoms, diseases, and sources of exposure relating to common environmental agents and conditions.
(3) Graduating medical students should be able to elicit an appropriately detailed environmental exposure history, including a work history, from all patients.
(4) Graduating medical students should be able to identify and access informational, clinical, and other resources available to help address patient and community environmental health problems and concerns.
(5) Graduating medical students should be able to discuss environmental risks with their patients and provide understandable information about risk-reduction strategies in ways that exhibit sensitivity to patients' health beliefs and concerns.
(6) Graduating medical students should be able to understand the ethical and legal responsibilities of seeing patients with environmental and occupational health problems (Pope & Rall, 1995, p. 17-21).

Of fundamental importance to all the competencies is the ability of the physician to obtain a thorough environmental health history. If done correctly, the history provides the primary information needed for diagnosis, referral, treatment, and prevention strategies (Pope & Rall, 1995).

Environmental Health Recommendations Addressing Nurse Practitioners

Bellack et al. (1996) surveyed American NP programs to determine current and ideal emphasis on environmental health, faculty preparation for teaching environmental health, environmental health competencies of graduates, didactic and clinical contact hours devoted to environmental health, and barriers or incentives to greater emphasis on environmental health. The program directors rated the expected competencies of graduates on a scale of one (not at all), to five (to a great extent). The competencies are in order, beginning with the highest rated at 3.39:

(1) Understanding the relationship between environmental hazards and human health.
(2) Access information resources related to environmental hazards and health.
(3) Counsel clients about how they can reduce risks associated with environmental hazards.
(4) Conduct environmental and exposure histories.
(5) Answer clients' questions about the harmful effects of pollution.
(6) Plan and implement care for clients with environmentally induced diseases.
(7) Serve as an advocate for reducing environmental hazards.
(8) Exert a direct influence on environmental public policy.
(9) Provide information to community groups about local environmental risk (Bellack et. al, p. 78).

The study found that more than two-thirds of NP program directors believed there should be greater emphasis on environmental health in their programs but expressed concerns about overcrowded curricula and lack of faculty preparation, as barriers to change. Two factors identified as most likely to increase the emphasis on environmental health in NP programs were (1) having nurse faculty with content expertise and (2) being able to access information resources related to environmental health.

In a later work, Bellack, Graber, O'Neil, Musham, & Lancaster (1999) explored curriculum trends in NP programs. The study ascertained the extent to which health

professions education programs include curriculum topics related to those competencies. The only specific mention of environmental health is a competency regarding reducing environmental health hazards. When NP programs ranked 33 curriculum topics for current emphasis, environmental health rated low on the list as number 30, out of 33. When ranked for ideal emphasis environmental health rated at 29, tied with care of the elderly. The first five highest rated competencies in descending order were (1) health promotion and disease prevention, (2) primary health care, (3) effective patient-provider relationships/communication, (4) patient teaching-education, and (5) professional values (Bellack, Graber, O'Neil, Musham, & Lancaster, 1999). The competencies are not exclusive from environmental health and all of them can incorporate aspects of environmental health. Regardless of the ranking, nurse practitioner educational programs may be incorporating principles of environmental health within the provision of primary health care, but not calling it as such.

Summary of Literature Review

A review of nursing and medical literature revealed clinical opportunities to address the basic needs of a healthy environment and healthy population. An evaluation of the health care literature reveals gaps in knowledge and practical solutions. A good knowledge base exists addressing the components of a toxic environment and how to prevent and treat many of the subsequent problems. A consensus exists within nursing literature that environmental health issues are important for all nurses. Family nurse practitioner education should meet the needs and demands of the general population. Several agencies and studies produced competencies in environmental health for the

nurse and the primary health care provider. To provide the most comprehensive care, the FNP could incorporate both the recommendations for physicians and those for registered nurses. This project aimed to identify and describe environmental health clinical practice competencies for FNPs by asking those in practice and environmental experts.

CHAPTER 3

METHODOLOGY

The following chapter summarizes the data collection procedures and project design. This section also includes a description of the population sample, survey instrument, and human subjects protection process. The method of data analysis is discussed.

Project Design and Data Collection

Project Design

The goal of the project was to propose a set of empirically derived practice competencies in environmental health for FNPs. The project employed a descriptive design that included questions sent to environmental health experts and FNPs. The investigator developed the questionnaire guided by concepts from environmental health, primary health care, and the conceptual framework of the project.

Sample Selection. To gain insight into environmental health topics for FNPs, seven experts in environmental health and eight practicing FNPs were interviewed. The investigator and project committee chair determined eligibility and invited ten environmental health experts to participate in the project. The experts are all currently involved in environmental health, research, and practice. The experts comprised a convenience sample with each participant contributing a unique background of

experience. Only currently practicing FNPs were included in the sample. Networking and snowball sampling led to the selection of practicing FNPs. All the subjects who participated were adults and no risks existed for participation. Seven environmental health experts and eight FNPs agreed to participate in the project. A list of study participants is provided in Appendix A.

Instrument and Data Collection Procedures. Questionnaires were used for data collection. The investigator developed two questionnaires, one for the FNPs and one for the experts (see Appendix B), that addressed complimentary topics. The questions in the two questionnaires addressed issues specific to both FNPs and environmental experts and reflect the conceptual framework of Bronfenbrenner's systems by exploring a wide variety of environmental health topics.

Possible participants (experts and FNPs) received a letter of invitation (see Appendix C) requesting their involvement in the project. The author mailed and received the letters and questionnaires via U.S. post or e-mail, over a three-month period. The investigator contacted ten environmental health experts and seven agreed to participate for a return rate of 70%. Forty FNPs were contacted and eight agreed to the terms of participation, yielding a return rate of 20%.

After agreeing to participate, the FNPs and experts received five questions by mail or e-mail. The questionnaire did not direct the participants to provide any personal information. The letter of introduction explained confidentiality issues with a willingness to respond implying consent. Participants were assured that their names would not be

linked to any particular data. The project presents aggregate data and anonymous quotes. Inclusion of the participant's names in the appendix lends credibility to the data.

Human Subjects Approval

The Rights of Human Subjects and Consent Process was followed and permission was obtained from the Montana State University-Bozeman College of Nursing Human Subjects Review Committee to proceed with the project on May 2, 2000. See Appendix C for Human Subjects approval letter and Human Subjects Proposal Summary.

Data Analysis

The project was qualitative in nature and content analysis was used to analyze data. Qualitative analysis imposes order on narrative data so that general conclusions are communicated with an emphasis on the meaningfulness of the product rather then control of the process (Norwood, 2000). Content analysis facilitates finding of convergence and divergence in the data. When conducting content analysis the investigator reads the entire data set and identifies important topics, words, phrases, or themes. Content analysis lends itself best to structured interviews or questionnaires (Norwood, 2000).

The investigator compiled questionnaire answers into two major categories (environmental experts and FNPs) for side by side comparison. Specific answers were broken down into categories according to question and further grouped according to specific theme. The themes were transferred to note cards, one theme per card. Most of the answers contained multiple themes per question. The project presents the data by question with themes tallied per question. After each individual question was addressed,

the investigator consolidated and counted all the themes and each participant received only one tally per theme, regardless of repetition, to delineate areas of convergence and divergence. To manage the large number of themes, data were transferred to a spreadsheet, arranged into three groups (FNPs, experts, and combination), and sorted by theme and number of tallies. This identified the number of times a theme was mentioned, with a maximum of once per participant, and allowed for simple comparison and analysis. Themes mentioned at least four or more times by both FNPs and environmental health experts were considered areas of convergence. Using the criterion of at least four tallies ensured that at least half or greater of the participants from both groups were represented, indicating a majority. Themes unique to one group tallied four or more times by one group but not the other were identified as areas of divergence. From the areas of convergence, clinical competencies for FNPs in the area of environmental health were recommended.

Project Time Line

The following table outlines major events in the project.

Work Completed	Nov 1999	Jan 2000	April-May 2000	Aug 2000	Sept-Oct 2000	Nov-Dec 2000	Jan 2001	March 2001
Project Conception								
Literature Search								
Human Subjects Approval								
50 Question-naires Sent								
Total of 15 Responses Obtained								
Data Analysis and Synthesis								
Project Defense								

CHAPTER 4

FINDINGS AND DISCUSSION OF THE PROJECT

This chapter presents the findings from the project. The data from the FNPs and experts are first described separately and then compared for areas of convergence and divergence. Areas of convergence and divergence are presented and discussed. From the areas of convergence, clinical competencies for FNPs were formulated, meeting the purpose of the project. Finally, the author outlines the strengths and limitations of the project and discusses future strategies addressing environmental health.

Summary of Results-FNPs

The investigator received eight responses from FNPs located in Virginia, Oregon, Alabama, Montana, Washington, and Florida. Each FNP received five questions and the responses varied from one word answers to lengthy, in-depth discussions. Most mentioned that although FNPs should be responsible for the health problems unique to their community, many important environmental health topics have no geographical boundaries. All FNPs focused on local environmental health problems but many also presented information universally important for all primary health care providers.

Responses to each question from the questionnaire are presented separately. Within the analysis of each question, every theme is listed. The percentages illustrate the frequency of which each theme was mentioned per question. An FNP may mention the

same theme in multiple questions. Analysis of the themes in total is presented during the discussion of areas of convergence and divergence.

Environmental Health Problems in Practice

For the first question, FNPs addressed clinical environmental health problems they encountered in their practices, in order of importance. Respiratory diseases ranked very high on all respondents' lists. All eight FNPs (100%) mentioned asthma as an important environmental health problem and seven out of eight (88%) reported it as the number one environmental health problem in their area. Other specific respiratory diseases, such as chronic obstructive pulmonary disease (COPD), lung cancers related to mining, asbestos, and smoking were mentioned on six (75%) of the FNP's questionnaires. The following explanation from an FNP describes her experience with respiratory disorders:

> I practice in a nurse-run and managed clinic in a community that has an air-inversion problem similar to that of Los Angeles - town in a valley, air traps when there is high-pressure, etc. In addition, many people heat their homes with wood stoves in winter (particularly in rural areas, lower socioeconomic neighborhoods). Grass (as in the kind lawns are grown of) is a major crop here, and as part of the growing process, grass fields are burned off in August and September. So, from August through March, air quality is a problem in our community. At our clinic, we see many children and adults with asthma. We also treat many people who do not have asthma but who, with respiratory infections really do struggle with reactive-airway-type symptoms requiring treatment even when the etiology is viral.

Four out of eight (50%) respondents cited poverty related health neglect as part of their lists and two FNPs (25%) mentioned insect bites and infestation as a common problem in their area. The rest of the themes to this first question were mentioned once each (13%) and are as follows; occupational injuries, sun exposure, ocean contamination,

in-utero drug/alcohol exposure, ionizing radiation, effects of dioxin, pesticides and herbicides, lead toxicity, chemical sensitivity, dermatitis, and obesity. One FNP reported that "all health problems that are not caused by genetics are caused by environment." Another FNP discussed the large amount of thyroid disease that she saw in practice and speculated a possible link to the environment. She also struggled with how to define or label a problem as environmentally related:

> Its difficult for me at times to separate what is "environmentally induced" from what is poverty/lifestyle induced. My patients are severely socioeconomically deprived. Obesity is a very pervasive problem. I perceive it to be a result of a multiplicity of factors related to poverty and sedentary lifestyle. Depressive attitudes of hopelessness/helplessness, inadequate education related to healthy nutrition, inadequate funds to purchase high quality foods, in some cases inadequate facilities for food storage and preparation, poor impulse control, and maybe plain old boredom. Is this then an "environmental health problem"? I don't know but I do wonder where the line is.

Opportunities to Prevent Environmental Health Problems

The second question investigated whether the FNPs encountered opportunities to prevent environmental health problems. They were also asked to list any environmental health topics that they would like to know more about. Five (63%) FNPs listed respiratory disorders such as allergic asthma, COPD, sinusitis, lung cancer, and sick building syndrome as commonly seen problems that the FNP may help to prevent. Although one FNP explained, "For the parents, smoking is an unhealthy choice. For the children it is an environmental health problem." Three of the eight (38%) FNPs reported that they either did not understand the question or left this question blank. Chronic poverty as a source of preventable environmental stress was mentioned twice (25%) as an

issue that they would like to learn more about. Occupational health was mentioned once (13%) as the "most important" issue:

> I believe there are probably opportunities to work with local businesses to help them help their employees understand more about and develop strategies for dealing with workplace health problems and/or things that cause workplace health problems. I think here about small businesses where workers face issues related to noise or chemicals or even workplace temperature regulation (working in extremely hot or cold areas)... OSHA has regulations, of course, but I don't know how well-equipped most small businesses are to do anything more than simply try to comply with the regulations (when inspectors are present) - there must be opportunities for NPs and other providers to help these small organizations educate their employees beyond simple compliance with regulations.

Other themes mentioned once (13%) were diabetes, hypertension, pesticide/herbicide poisoning, and obesity. Another FNP (13%) felt that an active community action role was more important than any specific skill:

> It would be of some help to NPs if we could understand more about the community-action role(s) we might play. That is, I am less concerned about having and/or maintaining the clinical skills and more concerned about how to be an active member of the community in looking for and addressing long-term strategies to help the community respond to and deal with issues related to environmental health.

Incorporating Environmental Health

For the next question, FNPs evaluated the environmental health skills seen in their own practices. Seven of the eight (88%) reported that they integrated environmental health topics into their practices, although one of the FNPs stated that environmental issues were "only mentioned to asthmatics." Of the seven who felt they incorporated environmental health skills, all mentioned including some form of environmental health questions in the history intake, routine physical assessments, and well child exams. Routine history questions specifically mentioned were occupational history, recreational

activities, military experience, and lead or chemical exposures. An FNP explained how she incorporates environmental health into her practice:

> Every client contact is seen as an educational opportunity. Even the smallest of the school children visiting the clinic can be a tool to educate the family. Community surveillance; tracking of health media reports; exposure history assessments; collaborative efforts with the community leaders, school personnel, university staff and students; communication skills; and encouragement of interdisciplinary referrals/treatment plans are some environmental health assessment skills incorporated into our practice.

Four of the eight (50%) explained that they did not need specific skills related to environmental health as they could apply general nurse practitioner skills to any problem caused by the environment. This sentiment expressed by one FNP as follows:

> After a while, one learns to ask, "Where do you work?" and many of the company/business names are familiar to us, so we know what to query about in terms of work place exposure. Still, I find myself looking up things (usually on the internet since that tends to be fast and there is information there not available in any single book on my shelf) about particular substances that might cause problems patients are having. Most of the small business & manufacturing companies do not have environmental nurses, but when they do, I often call them and query about a particular exposure. I do think most of what we do is symptom management, so I do not need any special skills related to environmental health, but rather apply general FNP skills to problems that may, in fact, be caused by environmental toxins.

Three FNPs (38%) reported collaboration with local environmental health experts. One FNP (13%) felt that she did not incorporate any environmental health skills. Lastly, an FNP reported, "Not sure what you mean by skills, but I am pretty stuck on most everything being influenced by environment!"

Clinical Competencies Recommended by FNPs

The fourth question asked the FNPs to recommend clinical competencies in environmental health that should be required for all FNPs. Three respondents (38%)

reported "unsure," or "do not know." The other five (62%) mentioned strong general assessment skills as the priority. One FNP (13%) reported that the following should be required along with good assessment skills: "The ability to set goals, implement plan of action, and evaluate outcomes of care. All these are necessary skills for any practitioner providing health care." Two FNPs (25%) stated that all FNPs should know how to involve local health departments or other expert resources in their practice. An FNP explained how she is able to collaborate:

> It has been helpful in our community that our local health department administrator participates in community-wide educational efforts for NPs, PAs, and physicians. This gives her an opportunity to listen to our concerns and to provide us with information and resources about air-quality, about contemporary treatment, and about community-action opportunities that we might not otherwise have via the 'usual' channels for continuing education opportunity. I would wish that every community would have this kind of resource for providers.

Two FNPs (25%) suggested competencies related to the basic understanding of the environmental relationship to health/illness, dose response assessment, and exposure pathways/analysis. One FNP (13%) mentioned risk characterization. Another FNP stated her recommendations as follows:

> Specific guidelines for frequency of assessment after known exposure. Guidelines that highlight symptom related exposures- i.e. The required detective work when environmental illness suspected. How to improve intake questionnaires that detail the persons exact exposure occupationally/ avocationally i.e. if a person states is a construction worker, need details of the actual work practices, and if OSHA rules and regs are followed etc.

One (13%) mentioned the ability to use equipment related to specific environmentally induced diseases, such as a spirometry machine to evaluate pulmonary function. Another FNP (13%) discussed the importance of routinely updating all clinical competencies and including environmental health as part of current health care trends. The following

competencies were each mentioned once (13%): Migrant/farm worker issues, communication and interpersonal relationship skills, research skills, and understanding of toxicology reports. One FNP (13%) provided a message of uncertainty: "Most of us are pretty conscientious about getting appropriate care for patients with specific health problems once identified, it's the diagnosis piece we need help with."

Comments or Suggestions

The fifth question provided FNPs the chance to list any additional comments. Three of the FNPs (38%) mentioned that the varied demographics of the participants might influence the project results. Two respondents (25%) expressed a new awareness of environmental health issues, as explained by one FNP, "Clearly this is an area where I need more information and time to consider!" Two (25%) left the question blank. One FNP (13%) stated that, "I don't think any aspect of environmental health was addressed in my FNP graduate program."

Summary of Results-Environmental Health Experts

The experts in environmental health have experience, expertise, and current involvement in environmental health, research, and practice. Their geographical locations varied but were intentionally similar to those of the FNPs. Seven environmental health experts responded to the questionnaire.

As with the FNP data, responses to each question from the questionnaire are presented separately. Within the analysis of each question, every theme is presented. The percentages illustrate the frequency of which each theme was mentioned per question.

Analysis of themes in total is presented during the discussion of areas of convergence and divergence.

Clinical Topics Important for FNPs

The first question pertained to clinical topics the environmental health experts felt were important for FNPs. Six of the seven (86%) respondents felt that respiratory disease as related to outdoor/indoor pollutants and air quality was a clinical topic of importance. Asthma was specifically mentioned by six (86%) of the seven experts, and explained by one:

> Asthma is certainly one of the clinical topics I would want FNPs to be alert to environmental implications. Although the data linking asthma to air quality has been debated, there are implications both for outdoor air (ozone and particulate matter, which are both Federal criteria air pollutants, and measures can be taken by individuals to control their impact on disease) and for indoor air (adequate circulation, building maintenance, use of chemicals and fragrances which may be triggers for asthma episodes are among the factors that would be amenable to preventive and control measures). Similar exposures can exacerbate other chronic respiratory conditions also.

The only respondent (14%) who did not mention respiratory disease felt the inclusion of any specific problem was too limiting and that clinical competencies should focus on assessment, a broad understanding of environmental problems, and local environmental issues. Assessment skills were mentioned by four (58%) of the experts with three (43%) making it their number one priority for FNPs. Specific recommendations about assessment skills were made including taking an exposure history, mechanisms and manifestations of exposure, and incorporating environmental health into a complete history and physical. Water quality was a subject reported by four (58%) of the seven experts. Specifically mentioned was ground water contamination, waterborne

microorganisms, drinking water standards, and the ability to interpret water quality consumer reports. Three experts (43%) listed reproductive problems related to the environment. Three experts (43%) felt that knowledge about pesticide exposure was an important topic and three experts (43%) reported lead poisoning as a critical area for FNPs. One outlined her recommendations:

> Lead poisoning - 52 million homes in the U.S. have some lead in them. We should know something about the housing stock of the communities we serve, as well as industry and prior industries in the areas that may contribute to lead exposures. The CDC has recommended practices re: lead poisoning prevention, treatment, referral, etc. NPs should read this document.

Two experts (29%) reported neurological conditions with possible environmental etiology, such as Alzheimer's disease, multiple sclerosis, and Parkinson's disease were important clinical topics for FNPs. Occupational hazards were discussed by two (29%) experts. Two others (29%) mentioned cancer and its relationship with the environment. In addition, acute illness related to food borne diseases, carbon monoxide, violent behavior, and developmental disorders were each listed once (14%). One expert issued these recommendations:

> Certainly covering materials that breed familiarity (CO, asthma, lead, ...) are comfortable and good places to start for recognition of the NP's contribution to environmental health assessments. It is important to take this one step further as some environmental health illnesses manifest themselves in a manner that is not typically recognized by the health care practitioner. Beryllium disease, methemogloinemia (sic), and asbestosis are some examples. These are however good examples of someone that might present with respiratory symptoms or fatigue and headaches that do not resolve with standard treatment. Doing an exposure history may reveal environmental "red flags" to further investigate. The non-resolution of standard treatment in and of itself is a red flag.

Specific Skills in Environmental Health

The second question asked of the environmental health experts related to specific skills that should be required of FNPs. Taking an assessment and exposure history were both mentioned by five of the seven (71%) experts as the most important topics and explained by one expert:

> In the case of environmental disease, the history is absolutely critical. Too many environmental diseases resemble non-environmental diseases and thus may be mis- or un-diagnosed. It is important to know if diseases are environmentally related so that strategies to prevent on-going exposure will be initiated. They should also understand the mechanisms of exposure (ingestion, absorption, and inhalation) and they should know what tests need to be done to identify specific exposures when identified...

Five of the seven (71%) also listed knowing mechanisms of exposure as a clinical competency skill for FNPs. Specifically reported were the elements that link environmental exposure with disease, routes of exposure, and related chemical and physical characteristics of the transport medium. The topic of risk was mentioned by five (71%) of the participants. The experts listed risk assessment, risk potential, and risk communication as important clinical topics. Risk communication was a skill mentioned by four (57%) of the seven experts. One person stated that FNPs must know, "The essentials of risk communication so as to provide good counsel and guidance for her patients without either over-emphasizing or minimizing potential risk." The four experts who mentioned risk communication felt that the FNP was uniquely positioned to intelligently interpret and disseminate risk communication issues. Three experts (43%) specifically talked about the FNP's ability to allay unfounded fears regarding exposure. Accessing resources and referrals was listed by four (57%) of the seven experts as an important skill. All four mentioned that the FNP should be familiar with a wide range of

resources from the Internet to local officials, one suggested keeping a "rolodex 101" of contacts and referrals for environmental problems. One environmental health expert (14%) felt that FNPs were in a position to incorporate environmental justice and advocacy issues for vulnerable populations. Another participant (14%) listed knowledge of environmental health infrastructure, laws, and regulations as a good clinical skill. The ability to specifically assess, diagnose, and treat respiratory disorders was mentioned once (14%) as the most important skill for an FNP. One expert (14%) suggested the skill of knowing what tests to order to identify specific exposures. One (14%) of the seven experts cited the IOM reports for both nurses and physicians. This expert felt that, "The nurse practitioner is in a unique position to acquire the skills for both a physician and a nurse that have been recommended as basic competencies in environmental health (they are actually both VERY similar)."

Differences Between Recommendations for RNs and FNPs

The next question asked environmental health experts to explain the differences between competencies required for FNPs and those for RNs. All seven (100%) of the respondents referred to the FNP's higher level of education and responsibility. The FNP should have all the environmental health competencies of a RN plus an in-depth understanding of such skills as assessment, treatment, patient counseling, and community resources. One expert explained, "FNPs have clinical responsibility for the whole person and whole family. Because of this, they should have more depth of understanding related to the environmental health risks in their patients homes, work, schools, and communities." Another expert felt that because FNPs have sustained contact with patients

they should "provide counseling and education for their patients and set the course for their health in the future." All seven (100%) experts listed exposure history and assessment as the most important environmental health related skills as ideal for the RN but essential for the FNP. Three of the seven (43%) stated that the FNP should be responsible for having basic knowledge about specific environmentally induced conditions. Two participants felt that FNPs had more of an obligation than RNs to collaborate with other health care professionals. One (14%) person mentioned the IOM report on nursing and environmental health and that the recommendations applied to FNPs. The other differences between RNs and FNPs, mentioned only once, were advocacy, risk communication, ethics, and basic information on environmental laws and regulations. Occupational health was specifically mentioned only once. One expert presented this perspective:

> The difference for me would be in the FNP's depth of understanding of the clinical implications of exposures and the additional information on treatment options. I might actually expect something less of FNPs in community advocacy, depending on their work setting, boundaries, and demands, but I would hope that they are part of an active professional network where their observations and data can be included in community health initiatives and feedback to environmental science professionals...and that they are active in their citizen roles!

A comment made by one participant concluded that FNPs "have less system back-up to make up for deficiencies in their assessment and diagnosis of patients' conditions, and thus, FNPs need more intensive education in environmental health so that its principles are incorporated into their practice."

Current Trends in Environmental Health

For the fourth question, experts discussed current trends in environmental health pertinent to FNPs. Three of the seven experts (43%) described a version of the sentiment that "patients are much more enlightened and concerned consumers regarding the environmental relatedness of their illnesses and symptoms." Three (43%) people cited the importance of understanding the politics related to health policy and environmental issues, and being able to interpret this policy to clients. Three experts (43%) considered pediatric environmental health a current "hot" topic. Two participants (29%) listed keeping track of and analyzing the barrage of new information and resources available as important. One expert explained her current topics:

> They should be aware of the multiple resources available to themselves and their clients (particularly valuable resources for NPs are the case studies developed by ATSDR) NPs should also keep apprised of the IOM efforts in terms of advancing nursing skills and knowledge related to environmental health. I guess one trend is recent revelations about the more subtle effects of environmental exposure among children...For example, problems that have been labeled as "behavioral problems" may in fact be related to an environmental exposure.

Trends discussed by one expert (14%) were not mentioned by anyone else and are as follows: "Homeless populations, elderly living longer environmental problems with latency issues may appear where we have never seen them before, junk science in the media and take home exposures can increase depending on economic stability." The IOM reports on health care professionals and the environment were mentioned once (14%). Finally, one expert (14%) discussed the relatively new emphasis on holistic health care and the inclusions of environmental health: "Environmental education, not just for health professionals but also beginning in elementary school and extending throughout life is an

encouraging trend." Environmental values were also mentioned once (14%) as a basic instinct to protect natural resources and respect for healthy living.

Comments and Suggestions

The experts added any other comments or thoughts for the last question. Interestingly, four of the seven (57%) respondents used this question to mention the FNP role as an integral part of a multidisciplinary health care team. An example as follows:

> I would like to emphasize the importance of the FNP's position in the health system because of her prolonged contact with patients and her resulting opportunity to make a positive difference in their health. The FNP, by incorporating environmental health into her practice, can also serve as a role model to and influence on other health professionals.

Two (29%) of the experts offered to share their environmental health resources, one specifically about training nursing faculty in environmental health. Another person (14%) felt that there was nothing more to add, as the IOM report on nursing and the environment covered everything. One expert presented this summary:

> I feel passionately that the environment can be a unifying force for health professionals, scientists and communities, and, in fact, for our nation because its protection embodies values that are universal in terms of our having safe places to live and raise our children, homes and neighborhoods that are pleasant places of respite and restoration, and good neighbors, whether they are individuals, institutions, or industries.

Discussion of Findings

The investigator compared data collected from the FNPs with the data from the environmental health experts. The discussion is broken down into areas of convergence and divergence between the two groups to meet the purpose of clinical competency

recommendations. Bronfenbrenner's model of ecology frames the discussion and recommendations for FNPs.

Areas of Convergence

Both groups covered many similar environmental health topics. Data from all 15 participants were combined. The investigator compiled, tallied, and analyzed data from 15 participants, disregarding the specific questions in the questionnaire. The same themes tallied four or more times from both the FNPs and experts were considered areas of convergence. All duplication of themes mentioned by the same participant but in different questions was eliminated. Of the 33 themes identified, most occurred only once or twice and are presented in the findings of the previous sections. The themes parallel those competencies for nurses and physicians presented by the IOM.

Assessment Skills. One hundred percent of the group of FNPs and experts discussed the importance of excellent assessment skills in relationship to environmental health. The themes of physical assessment and exposure assessment were combined as most of the participants used the themes interchangeably. Four of the FNPs mentioned exposure assessment as an integral part of a general assessment. Six of the experts specifically discussed exposure assessment and one mentioned it as incorporated into a general assessment. A thorough, complete physical assessment is critical to any patient encounter. These data reveal that the FNP may already include an environmental health exposure assessment as an essential part of a complete history and physical but may not recognize it as addressing environmental health. Even with a comprehensive assessment, identification of the specific warning signs of environmentally induced conditions may be

a weakness if the FNP is not familiar with the unique manifestation of many environmentally induced conditions. Assessing a client holistically, recognizing all of the client's environments (microsystem, mesosystem, exosystem, and macrosystem) is part of a complete assessment leading the FNP to appropriate diagnoses and treatments. Including all the environments (systems) involves asking the appropriate questions about the home, neighborhood, occupation, recreation, socioeconomic status, and available resources. A working knowledge of the client's geographical and social context facilitates the assessment, guiding the questions asked. The nature of the client encounter drives the depth to which the FNP pursues the related contextual assessment. The time spent with the patient should be maximized within the constraints of agency guidelines. Incorporating the environmental systems into the assessment, diagnosis, and treatment allows that time to be used for the greatest advantage. The recommendation addressing this theme is as follows:

- The FNP should conduct a careful, systemic assessment that elicits both exposure and disease data pertaining to environmental health.

Respiratory Diseases. Fourteen of fifteen (93%) participants discussed environmentally induced respiratory disease as a clinically important environmental health topic. The only person in the study not mentioning respiratory diseases felt that emphasis on any specific health issue was too limiting. Fourteen out of fifteen (93%) specifically included asthma. Thirteen of the group (87%) also discussed other respiratory diseases such as COPD, lung cancers, and sinusitis. Only six people (40%) mentioned air quality but, as air is essential to respiration and air quality often determines the extent and

effects of the respiratory disease, the two themes are interrelated. The FNP should educate the client about avoiding obvious respiratory irritants such as smoke and pollen. The FNP should also assess for the less obvious environmental causes and the environmental systems affecting the client. For example, the FNP should educate the patient about past or current inhalation of such hazards as asbestos, Hantavirus, or chemicals. Chronic respiratory problems may stem from a client's occupation as a sandblaster or a home close to a factory or busy street. The conclusion addressing this theme is:

- The FNP should identify and treat respiratory disorders and implement risk reduction strategies for environmentally related respiratory conditions.

Local or Specific Environmental Health Problems. Eight participants (53%) thought that a working knowledge of specific environmentally caused health problems was essential for FNPs. All eight FNPs listed at least three clinical health problems related to the environment that they currently encounter in practice. All seven experts discussed at least one specific health problem in their questionnaire. Family nurse practitioners should familiarize themselves with local environmental hazards and induced disease for recognition, treatment, and prevention strategies in their community. An abnormally high incidence of arsenic caused bladder cancer in the community may trigger aggressive diagnostics for those with recurrent urinary symptoms. The knowledge of local issues encourages the FNP to consider the encompassing environmental systems such as policy related to arsenic cleanup, screening clinics, and social concern for the issue. Six of the seven environmental health experts proposed a basic understanding of

several nationally common environmental health problems. The group reached no consensus about any specific environmentally induced disease, except respiratory illness. By using totals from both the FNPs and the experts, the most frequently identified specific environmental health problems are: poverty (six people, 40%), occupational health (five people, 33%) pesticides (five people, 33%), water (four people, 27%), and lead (four people, 27%). All of the other specific environmentally induced diseases were mentioned three or fewer times. Recommendations for this theme include:

- The FNP should be able to identify agents and health consequences associated with local environmental hazards.
- The FNP should understand the relationships between poverty and environmental health, as well as clinical topics addressing occupational health, effects of pesticides, water quality, and lead poisoning.

Pediatrics. Four FNPs and four experts (53% of the total) discussed children and environmental health. As part of a thorough assessment the FNP should recognize specific environmentally induced problems in children including which conditions are especially hazardous for children. Factors in Bronfenbrenner's systems such as policy, economic conditions, and social customs may affect minors differently than adults. Because children rely upon adults for protection, the FNP should educate parents and caregivers regarding environmental hazards and pediatric manifestations. The FNP could incorporate environmental health education as part of a well child exam in the history, physical, and anticipatory guidance. The environmentally caused problems unique to children may present as behavioral or learning disabilities and the FNP should rule out an

environmental etiology. As pediatric environmental health emerges as an area of study, the FNP should continually seek information about this theme. The conclusion for the theme of pediatrics follows:

- The FNP should address pediatric environmental health, paying special attention to the child's unique susceptibilities, illness manifestations, and environments.

Resources, Referrals, and Collaboration. The investigator combined these three themes, as most participants who mentioned them used the words resource, referral, and collaboration, interchangeably. Six (40%) of the group discussed collaboration with other health care professionals. Collaboration is usually interpreted as two or more health care professionals taking equal responsibility for a client, whereas referral is interpreted as passing the client on to someone who will assume all responsibility until further notice. Most participants did not make these distinctions in their comments. Also closely related were the themes of resources and referrals. Whether the resources were current literature or a local health department, participants stated that referrals came directly from resources and vice versa. Eight of the fifteen (53%) cited the ability to access resources in environmental health. Referrals were mentioned by six (40%) of the group. Ten of the fifteen (67%) discussed one of the themes of referral, collaboration, or resources. The FNP may have a list of favored referrals, which should also include those for environmental health. Family nurse practitioners should familiarize themselves with rapid information access such as the Internet, to facilitate expansion of their available resources. The conclusions for this theme are the following:

- The FNP should locate local environmental health experts for both collaboration and referrals.
- The FNP should proficiently access scientific and clinic information addressing environmental health topics.

Areas of Divergence

Themes unique to one group, tallied at least four times by one group and two or fewer times by the other, were classified as areas of divergence. The divergent themes are remarkable in that they illustrate a clear difference in opinion about environmental health priorities for primary health care.

Policy. Four experts (57%) discussed the importance of the FNPs familiarity with policy related to environmental health. This compares with two FNPs (25%) who mentioned this theme as important. Possibly, the FNP may not recognize environmental health policy as health care policy or the FNP may not identify policy issues as a health care priority. As part of individual and community care, FNPs could become familiar with local environmental health policy. The role of advocacy remains integral to primary health care. For the FNP to follow and influence policy made at the community level and higher represents one form of client and community advocacy. Environmental health policy surrounds such issues as violence, environmental justice, infrastructure, and economics.

Poverty. Although poverty is listed within the convergence topic of local or specific environmental health problems, separately it is not considered an area of

convergence. Four FNPs (50%) discussed this theme but only two (29%) experts discussed poverty. Several hypotheses exist for the divergence. Family nurse practitioners probably directly encounter the health effects of poverty in their patients on a daily basis. The scope of primary health care includes understanding the unique health care needs of indigent clients. Socioeconomic issues complicate many environmentally induced conditions. The FNP's awareness of this theme speaks positively of their holistic care. The environmental health experts rarely brought up poverty issues. The experts may not recognize poverty as a clinical topic for FNPs. Poverty is tied closely with many environmental health themes that were mentioned. For example, low-income housing projects and neighborhoods may not have the power or resources to eliminate lead based paint, asbestos, unsafe playgrounds, or violent gangs. By incorporating awareness of a client's socioeconomic status, FNPs can better advocate for and treat each person. The FNP may also be more familiar with policy issues surrounding poor clients.

Perhaps the experts assumed poverty was already part of specific themes such as pediatrics. Environmental health experts may assume that poverty is only a precipitating or mitigating factor in environmentally induced disease but not an environmental health issue. The gray area between poverty and environmental health speaks to the varied definitions and interpretations of environment. By using Bronfenbrenner's model to define environment, poverty is clearly an influential piece of a client's environmental health.

Risk. The investigator combined the themes of risk assessment, risk communication, and risk awareness. Five of the environmental health experts (71%) felt

that risk was a topic important for FNPs, while only one FNP (13%) mentioned the theme. Risk assessment and risk communication are an integral part of environmental health. One explanation for the divergence in data may be an issue of semantics or interpretation. Environmental health experts are probably well versed in the meaning of risk. The FNP may be participating in risk assessment and communication but not calling it as such. Interpreting a client's chances of developing a condition, allying fears, and presenting accurate data are all forms of risk communication and often part of patient interaction. When an environmental health emergency strikes a community the FNP represents a trusted and reliable source of information, thus the FNP engages in risk assessment and risk communication. The FNP should understand the principles of accurately assessing and interpreting risk to better field questions and concerns about environmental health issues.

Water. The contamination of water was a theme discussed by four (57%) the environmental health experts. None of the FNPs brought up this theme. Most FNPs have probably dealt with the health effects of waterborne infections such as parasites or Hepatitis A. Although problems with water in the U.S. have decreased, many communities in the U.S. do not enjoy potable water. Poor filtration or toxic runoff threatens many clean water supplies. Many developing countries have abysmal water quality. The FNP may encounter patients who have traveled to these areas and should be responsible for knowing how best to treat those clients. FNPs may not understand how to respond to unsafe water in their own community. In addition, FNPs may link water quality with microbial disease contamination but do not consider chemical

contamination. The FNP participants in this project may not routinely encounter water borne illness and subsequently do not consider it an especially important problem. Family nurse practitioners should maintain awareness of issues concerning water quality in their community and throughout the world.

Competency Recommendations for FNPs

The following recommendations, derived from the areas of convergence from the FNP and expert data, represent clinical competencies for FNPs. The recommendations are unique in that they are issues agreed upon by both environmental health experts and practicing FNPs. A discussion of the competencies and their relationship with the conceptual framework follows the competencies.

Clinical Competencies

1. The FNP should conduct a careful, systemic assessment that elicits both exposure and disease data pertaining to environmental health.
2. The FNP should identify and treat respiratory disorders and implement risk reduction strategies for environmentally related respiratory conditions.
3. The FNP should be able to identify agents and health consequences associated with local environmental hazards.
4. The FNP should understand the relationships between poverty and environmental health, as well as clinical topics addressing occupational health, effects of pesticides, water quality, and lead poisoning.

5. The FNP should address pediatric environmental health, paying special attention to the child's unique susceptibilities and environments.
6. The FNP should locate local environmental health experts for both collaboration and referrals.
7. The FNP should proficiently access scientific and clinical information addressing environmental health topics.

Discussion

The scope of FNP primary health care practice includes all the clinical competencies. The competencies highlight aspects of health care practice that may already be incorporated by the FNP. The competencies also describe how an FNP may most efficiently incorporate environmental health topics into daily practice.

The presented competencies relate to the conceptual framework of Bronfenbrenner's environment systems in several ways. The areas of convergence essentially address environmental health concerns at the microsystem and mesosystem, or the client's immediate environments of home, work, and neighborhood. The effects of government policy and cultural norms of the exosystem and macrosystem are not explicitly delineated in the clinical competencies as the competencies represent a convergence in data from both groups of participants.

The overarching cultural norms and societal values that greatly influence our multiple environments are important to the practice of each clinical competency. The components of the macrosystem may be implied underpinnings of all the themes, as cultural values often drive the importance placed on health, education, children, wealth,

and the natural environment. Social norms also play and important role in what receives value. The themes of policy as (addressed by more experts) and poverty (as addressed by more FNPs) in the area of divergence, relate to the exosystem and the macrosystem. Including these areas of divergence into the list of clinical competencies would increase the representation of all the ecological systems and broaden the environmental health perspective of the FNP who incorporates the competencies. Participants from both groups did discuss the macrosystem elements of overarching cultural norms and societal values when describing some specific themes or questionnaire answers. Overall, more environmental health experts than FNPs discussed themes that fall into the exo or macro systems. This may be due to the expert's extensive awareness of the numerous factors that play a role in any environmental health hazard. The FNP may not immediately recognize the encompassing ecological systems that surround an environmental health hazard. The FNP, by definition, is responsible for understanding the family, neighborhood, and broader context of each client, to provide holistic care. Although the FNPs in this project may not have mentioned many environmental health issues using the broader context of the macrosystem, the discussion of poverty reflects an expanded perspective of poverty as an environmental health hazard. As a health care professional, the FNP's priority is to provide the best clinical care and the competencies thoroughly reflect that priority.

Similarities exist between this study's competencies and the competencies for nurses, physicians, and nurse practitioners presented by other studies and national work groups. The project's recommended clinical competencies extend the other recommendations with an emphasis on specific detail. The environmental health clinical

competencies listed by the national consensus groups cover wide, general topics. These general topics are excellent for their inclusiveness but possibly too broad for quick daily incorporation by the FNP. This study's recommendations consider the unique position of the FNP as an advocate for clients of all ages, community role model, and holistic care provider.

Strengths and Limitations of the Project

Strengths

The strengths of the project focus on its uniqueness. Although the literature covers specific recommendations for nurses and physicians no prior publications were located that explore how an FNP incorporates environmental health into practice. Literature was not found concerning environmental health issues that FNPs agree on as important and feasible for inclusion into primary health care. The project also attempted to combine opinions from a variety of geographical areas to ensure diversity in data and universally accepted conclusions.

Uniqueness. The information presented is new, documenting qualitative data on environmental health clinical competencies for FNPs, from both practicing FNPs and experts in the field of environmental health. Experts and FNPs identified the areas of environmental health they felt were the most important for incorporation into daily clinical practice. Clinical recommendations derived from the areas of agreement between the two groups had the support of a sample of environmental health experts and practicing FNPs.

Enhances Current Literature. The project compliments the literature concerning nursing and environmental health by addressing FNPs and the incorporation of environmental health in their practices. Although publications discuss environmental health topics for FNPs to address, none were found that address how environmental health is actually incorporated by FNPs and what issues they feel are important for practice.

Sample. Collecting responses from different parts of the country added depth and unique variation to the data. By including data from FNPs and experts from various parts of the U.S., the themes included both locally important and nationally significant subjects.

Support from Environmental Health Experts. The project greatly benefited from the wisdom of environmental health experts nationwide who provided an enormous amount of detailed information. Because of their assistance the project contains the most accurate and up to date knowledge about environmental health. Each unique contribution also lent credibility to the project.

Limitations

The project's limitations may affect the quality of the findings but do not lessen the importance of addressing environmental health in primary health care.

Sample. The geographical differences of the FNPs were a limitation of the project. A problem such as ocean pollution has significance for an FNP on the coast but little clinical importance for an FNP in Montana. All FNPs should be encouraged learn

about local environmental health problems as well as incorporate basic knowledge of environmental health problems into practice. The small sample size of both the FNPs and the experts limited the validity and reliability of the results. The small number of environmental health experts in the country obviously limited who could be invited to participate but there was a response rate of 70% (n=7). Of the forty FNPs invited only 20% (n=8) participated.

Potential for Response Bias. Only one of the FNPs who returned a questionnaire stated they did not think they incorporated environmental health into their practice. It is possible that those FNPs who did respond had more interest or greater knowledge about environmental health and thus may not be representative of most FNPs. The environmental health experts had probable bias toward the topic.

Questionnaire. Only one environmental health expert expressed problems understanding a question. Six questions out of the forty (15%) returned by the FNPs were marked "unsure," "don't know," or had no answer. This phenomenon may be the result of several factors. The questions may have been poorly or confusingly written, thus decreasing comprehension. The respondents may have simply not known the answer to the question or the question had no relevance to their clinical practice. The prompts on the questionnaire may have also influenced the responses by both the FNPs and the experts.

Competencies. The project was framed in the ecological perspective of Bronfenbrenner's micro, meso, exo, and macro systems. The clinical competencies

identified from convergence in the data do not reflect the consideration of all of these systems. The project has identified the importance of using all of the systems to understand the complexity of an environmental health hazard. Because the competencies do not encompass all of the relevant systems of influence, this is a limitation of the project. Ideally, each competency should address the micro, meso, exo, and macro systems of influence. This would give the FNP the most comprehensive clinical skills for incorporating environmental health into practice.

Future Strategies for Addressing Environmental Health

The project defines clinical practice competencies for FNPs and the next section highlights future strategies for facilitating and incorporating basic environmental health issues, including changes in higher education, continuing education, and simple clinical practice tools.

Family Nurse Practitioner Programs

The incorporation of environmental health into FNP practice starts with the inclusion of environmental health topics in FNP programs. Previous reviews of FNP curricula have demonstrated that there is little emphasis on environmental health in FNP education programs. The factor most likely to increase emphasis on environmental health in U.S. nurse practitioner programs is having faculty with expertise in environmental health (Bellack et. al, 1996). Therefore, FNP programs should expose faculty members to additional training in environmental health. Most nursing leaders in environmental health have opposed forming a new specialty area and recommend integrating environmental

health content into existing areas of practice (Butterfield, 1999). Family nurse practitioner programs could incorporate environmental health into existing curricula as clinical examples or as an integral part of health history taking or disease management. Assessment of environmental hazards and risks as a routine part of patient assessment creates awareness and enhances the importance of environmental health. Approaching the inclusion of environmental health content as refinement and clarification of existing content may lead to better acceptance of course revisions and the realization that there need not be major additions to an already full curriculum (Uphold, 2000). Reorganizing, rephrasing, and using environmental health terms may be all that is necessary in many areas of the curriculum that already indirectly address the topic.

Continuing Education

Continuing education focusing on environmental health issues should be offered by organizations, conferences, and training centers. Family nurse practitioners that did not have environmental health included in their educational programs or those who would like to learn more about the topic should have more opportunities for study in this area. A push for the inclusion of environmental health in primary health care journals is another way to enlighten FNPs and all primary health care professionals, especially due to rapid changes in environmental health science.

Clinical Tools

Clinicians, especially recent graduates, often refer to quick reference books, cards, and posters. These simple clinical tools can be useful for confirming a diagnosis, educating a patient, interpreting an EKG, or as a reminder of how a product is dosed or

administered. After consulting a quick reference tool enough, the clinician may commit the information to memory making it an integral part of daily practice. Perhaps such a tool devoted to a simple inclusion of environmental health could be useful in daily practice. Such a tool could be effective by including an exposure assessment, listing local resources, and triggering red flags of environmentally induced diseases. A quick reference such as this may initiate an increased awareness of the topic as well as provide useful and essential information for an interested clinician.

Conclusion

Nursing's role in environmental health began when Florence Nightingale sought to better the health of her patients by improving their surroundings. The FNP builds on this legacy by incorporating environmental health into daily practice. Bronfenbrenner's model describes the microsystem, mesosystem, exosystem, and macrosystem as levels of environment critical to the health of a patient. Environmental hazards exist in all the levels and the FNP practicing primary health care should include assessment of these levels to provide clients with the most thorough care. Physical environments and ecosystems are connected to the economic, social, and spiritual health of the community (Hofrichter, 2000). The knowledge of environmental links to health increases rapidly and FNPs should incorporate clinical competencies in environmental health.

The project explored areas that both experts in environmental health and FNPs regard as crucial for clinical practice reaching conclusions about clinical competencies derived from the areas of convergence between the two groups. If the FNP places the recommended clinical competencies in environmental health into practice, the individual

client and whole community will benefit. Most FNP educational programs place little to no emphasis on environmental health and these educational programs should incorporate the topic into existing curricula.

Primary health care encompasses a basic level of health care that considers the larger sociopolitical context of health care delivery, maintaining a commitment to access, equity, affordability, and an emphasis on vulnerable populations. Perhaps, health care professionals view environmental health less as a specialty and more as a routine part of primary health care, already integrated into a holistic practice. This premise provides insight into the data provided by the FNPs and the areas of agreement and disagreement with the environmental health experts. Conceivably, incorporating environmental health into practice only requires one competency, a thoughtful awareness of the context of all things. Health care professionals have an obligation to conduct themselves in an environmentally considerate manner, thinking globally and acting locally.

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APPENDICES

APPENDIX A

LIST OF PARTICIPANTS IN THE PROJECT

FNPs
Mary Bortko, FNP Ennis, Montana
Patricia Carrick, MSN, FNP Dillon, Montana
Cindy Fitzgerald, ARNP, FNP Spokane, Washington
Brenda Holloway, MSN, FNP Mobile Alabama
Keven Comer Bozeman, Montana
Deanna McDermott, ARNP, FNP Bandon, Oregon
Joan Shettig, MSN, FNP Charlottesville, Virginia
Laura Solmaz, MSN, ARNP, FNP, CS Miami, Florida

Environmental Health Experts
Sheila Brown Arbury, RN, MPH Program Coordinator Association of Occupational and Environmental Clinics 1010 Vermont Ave., N. W. #513 Washington DC 20005
Lillian Mood, RN, MPH Director, Risk Communication South Carolina Dept. of Health and Environmental Control 2600 Bull Street Columbia SC 29201
Grace Paranzino, MS RN, CHES MCP Hahnemann University School of Medicine Community and Preventive Medicine 2900 Queen Lane Philadelphia PA 19129-1096
Cherryll F. Ranger, RN Division of Health Education and Promotion Agency for Toxic Substances and Disease Registry Executive Park, Building 4 1600 Clifton Road, NE, E-33 Atlanta GA 30333
Donna Rennie, RN, PhD University of Saskatchewan Department of Medicine Wing 3E, Royal University Hospital Saskatoon, Sask. Canada S7N OXO
Mary K. Salazar, Ed.D., C.O.H.N.-S. Associate Professor Director, Occupational Health Nursing University of Washington School of Nursing Box 357262 Seattle WA 98195-7262
Barbara Sattler Director, Environmental Health Education Center University of Maryland School of Medicine and Nursing 655 W. Lombard St. Baltimore MD 21201

APPENDIX B

FNP AND ENVIRONMENTAL HEALTH EXPERT

QUESTIONNAIRES

Questionnaire for Family Nurse Practitioners

1. What clinical environmental health problems (e.g. environmentally induced asthma, lead toxicity) do you see in your practice? Please list any problems you see in order of the frequency that they occur in your practice.

2. Do you encounter opportunities to prevent environmental health problems that you would like to understand more about? Please list any that you are interested in, in order of importance.

3. How do you incorporate skills addressing environmental health into your practice (e.g. screening, referrals, and diagnosis of environmentally induced problems)?

4. What clinical competencies do you think should be required (e.g. content areas, specific assessment, diagnosis, and treatment skills) in environmental health? Please provide rationale for your answers.

5. Anything else you would like to add?

6. Would you like a copy of the study once it is completed?

Questionnaire for Environmental Health Experts

1. What clinical topics (e.g. environmentally induced asthma) do you think are important for Family Nurse Practitioners to know about environmental health? Please provide rationale as to why each topic is important.

2. What specific skills (e.g. referral to specialists, assessment, diagnosis, treatment) should be required minimal clinical competencies in environmental health for Family Nurse Practitioners? Please provide rationale for your recommendations.

3. What are the differences between your recommendations for registered nurses and Family Nurse Practitioners?

4. Are there any current trends in environmental health of which Family Nurse Practitioners should be aware?

5. Is there anything else you would like to add?

6. Would you like a copy of the study once it is completed?

APPENDIX C

APPLICATION TO THE MONTANA STATE UNIVERSITY

COLLEGE OF NURSING

HUMAN SUBJECTS REVIEW COMMITTEE

AND COVER LETTER

POLICY #F-4
ATTACHMENT #2

FORM A.2: TO BE COMPLETED BY THE INVESTIGATOR (GRADUATE STUDENT)

MONTANA STATE UNIVERSITY
COLLEGE OF NURSING
HUMAN SUBJECTS PROPOSAL SUMMARY

Submit one copy of the full research proposal with five copies of this form (which includes attachment of the proposal summary) and two blank copies of Form B to the Associate Dean's Office 14 working days in advance of the Committee's meeting. (Refer to Policy F-4, page 4 of 4, for additional information.)

Date of Submission: 4-18-00

Name of Proposal: Environmental Health Clinical Competencies for FNPs
Name of Investigator(s): Valli Stager
Signature of Thesis/Project Chair: Esther Butterfield
If seeking EXEMPT status under Federal Regulation 45 CFR 46, please indicate the specific exemption you are seeking:

_ 46.101(2)(b)(1). Research will be conducted in an established educational setting and involves standard educational practices.

_ **46.101(2)(b)(2). Research involves the use of educational tests. Information taken from them will be recorded so that subjects cannot be identified.**

X 46.101(2)(b)(3). Research involves survey or interview procedures and responses will be recorded so that subjects cannot be identified.

_ 46.101(2)(b)(4). Research involves observation of behavior and observations will be recorded so that subjects cannot be identified.

_ 46.101(2)(b)(5). Research involves the study on collection of existing data, documents, or records. Information will be recorded so that subjects cannot be identified.

NOTE: See page two for instructions on completing the proposal summary (to be attached).

☑ Approved/NO Revisions Needed:

Signature, Chair, College of Nursing, Human Subjects Review Committee / Date

Distribution of Form A.2 (page 1 of 2) following Committee Review:
Original: Investigator(s)
Copies: **Thesis/Project Chair**
Campus File
College of Nursing Human Subjects Review File in Bozeman (OARS)
University Human Subjects Committee through College of Nursing Associate Dean's Office

MONTANA STATE UNIVERSITY
BOZEMAN

College of Nursing

Main Campus
Sherrick Hall
P.O. Box 173560
Bozeman, MT 59717-3560
Phone (406) 994-3783
Fax (406) 994-6020

Billings Campus
Campus Box 574
MSU • Billings
Billings, MT 59101
Phone (406) 657-2912
Fax (406) 657-1715

Great Falls Campus
2100 16th Ave. South
P.O. Box 6010
Great Falls, MT 59406-6010
Phone (406) 771-4450
Fax (406) 771-4449

Missoula Campus
32 Campus Drive
Missoula, MT 59812-8238
Phone (406) 243-6515
Fax (406) 243-5745

May 2, 2000

Valli Stager, BSN, RN
622 South Clark Street
Butte, MT 59701

Dear Valli,

The MSU-Bozeman College of Nursing Human Subjects Review Committee met today to review your thesis/human subjects proposal. I am pleased to inform you that with a couple of minor changes, the committee has approved your proposal and you may begin data collection. The proposed changes are:

- On your Letters of Invitation, please add your phone number and/or e-mail address and that of your committee chair so that participants can call/e-mail you if they have questions;
- Add a sentence to the Letters of Invitation regarding how long you anticipate their participation will take; and
- Tell the participants, in the Letters of Invitation, where and for how long you plan to store the data and when/how it will ultimately be destroyed.

Our best wishes in the completion of this interesting study in partial fulfillment of the requirements for the MN degree.

Sincerely,

A. Gretchen McNeely, DNSc, RNC
Chair, CON Human Subjects Review Committee

cc: Patricia Butterfield, PhD, RN, Thesis Chair

Human Subjects Proposal Summary

Purpose of the study

A qualitative content analysis of convergence and divergence, making conclusions and recommendations about clinical/practice competencies for Family Nurse Practitioners (FNPs) in the area of environmental health, by interviewing experts in environmental health and practicing FNPs.

Subjects

Six experts in environmental health and six FNPs will be asked questions. All participants will be adults. The experts will be chosen for their experience, expertise, and current involvement in environmental health studies, research, and practice, as determined by an expert peer. Anyone who is not an expert in the field of environmental health will be excluded. Only FNPs in current practice will be chosen. Anyone who is not a currently practicing FNP will be excluded. The committee chair will recommend the experts. The practicing FNPs will be found through networking and snowball sampling. The geographical area for finding the subjects will be the United States. Either the committee chair or the graduate student will approach the subjects. A letter will be sent to chosen subjects, describing the study and their possible participation. They will then be given the opportunity to accept or decline participation in the study, and if they decline, no further questions will be asked and no second attempt will be made. The subjects will not be offered compensation for participation. The study will take place at MSU Bozeman using e-mail, mail, telephone, and possibly face to face interviews with the participants.

Procedure

Data from the environmental health experts will be collected first. The participants will be sent a letter of invitation, requesting their involvement in the study. The letter will explain that their willingness to respond to further questions implies their consent. The participants will then be sent 5 questions, over e-mail, concerning clinical environmental heath competencies and topics for FNPs. Verbal consent will be obtained to conduct a follow up phone interview, if necessary to clarify answers. Answers and dialogue will be obtained and recorded using the Internet, telephone, mail, or, if necessary, personal interviews where notes are taken. Time involvement for the subjects is estimated at no more than 2 hours, total, per subject. Restrictions on usual life patterns will be the time spent completing the answers to the research questions and interview.

Risks and Benefits

The risks to the participants are minimal to none. Time spent answering questions may be slightly burdensome, as the proposed subjects are probably extremely busy

people. Adverse effects of the research are extremely unlikely, they will not be asked for any personal information. Possible benefit to the subjects is personal satisfaction from participating in a research study that may be beneficial to both the realms nursing and environmental health.

Confidentiality of the data

All subjects will be explained, in the initial letter, that their names will be listed in the final project, but no data will be linked to any individual or geographical area. Only aggregate text data will be presented. A listing of participants will be included to lend credibility to the data. All data will be kept in a locked file.

Deception

There will be no deception of the subjects.

Attached Materials

Letters of invitation and questionnaire are attached.

Letter of Invitation for Environmental Health Experts

August 5, 2000

Dear Ms. (Name of Expert),

I am a graduate student in the Family Nurse Practitioner (FNP) Program at Montana State University, and received your name from Dr. Patricia Butterfield, who serves as my academic advisor. My graduate project addresses the inclusion of environmental health issues in FNP clinical practice. As you know, in 1995 the Institute of Medicine released recommendations for registered nurses in the area of Environmental Health. However, I am focusing exclusively on FNPs and the knowledge base they need to effectively prevent and minimize health problems of environmental etiology. I am interested in environmental heath clinical topics that fall within the scope of primary care practice. Because of your leadership in the field of environmental health, I am very interested in your recommendations.

I am requesting your permission to conduct a two-part interview. Part one includes five questions addressing environmental health clinical competencies for FNPs that will be e-mailed to you. Part two is a follow-up telephone call, if necessary to clarify and expand on the data received. The information that you give me will then be analyzed using content analysis, and compared with data from practicing FNPs, with the goal of identifying areas of convergence and divergence.
If you agree to participate, I am requesting that you allow me to print your name in a list of participants for this study, as a list of participants will lend credibility to the data. Specific recommendations or data will not be linked to any individual or to a geographical area. Only data aggregated by group will be published.

There will be no consent form, and a willingness to respond to the questions implies consent. Your total participation time is estimated to be no longer than two hours.
I will be e-mailing you the short questionnaire in one week. If you choose not to participate, thank you for your time, and disregard the forthcoming e-mail. If you agree to participate in the interviews, please respond within the next few weeks. Feel free to contact either of us.

Thank you for considering being a part of this project,

Valli Stager, BSN, RN

Family Nurse Practitioner Student
622 S. Clark St
Butte MT 59701
(406)-723-0262
vallieven@aol.com

Pat Butterfield, Ph.D., RN

Associate Professor of Nursing
Montana State University
(406)-994-2763
pgb@montana.edu

Letter of Invitation for Family Nurse Practitioners

October 1, 2000

Dear (Name of FNP),

I am a graduate student in the Family Nurse Practitioner (FNP) Program at Montana State University. I received your name from (Name of contact here).

My graduate project addresses the inclusion of environmental health issues in FNP clinical practice. In 1995, the Institute of Medicine released recommendations for registered nurses in the area of Environmental Health. However, I am focusing exclusively on FNPs and the knowledge base they need to effectively prevent and minimize health problems of environmental etiology. I am interested in environmental heath clinical topics that fall within the scope of primary care practice. Because you are an FNP, I am very interested in your recommendations.

I am requesting your permission to conduct an interview, via questionnaire, of five questions addressing environmental health clinical competencies for FNPs. The information that you give me will then be analyzed using content analysis, and compared with data from environmental health experts, with the goal of identifying areas of convergence and divergence.

Your data will be anonymous, specific recommendations will not be linked to any individual or to a geographical area. Only data aggregated by group will be published. There will be no consent form, and a willingness to respond to the questions implies consent. Your total participation time is estimated to be no longer than two hours. Enclosed is the short questionnaire. If you choose not to participate, thank you for your time. If you agree to participate in the interviews, please respond within the next few weeks. Return your comments in the envelope provided or feel free to e-mail your answers to vallieven@aol.com

Thank you for considering being a part of this project,

Valli Stager, BSN, RN

Family Nurse Practitioner Student
622 S. Clark St
Butte MT 59701
(406)-723-0262
vallieven@aol.com

Pat Butterfield, Ph.D., RN,
Thesis Committee Chair
Associate Professor of Nursing
Montana State University
(406)-994-2763
pgb@montana.edu