

ENVIRONMENTAL HEALTH ADMINISTRATION BASICS

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Introduction

Administration involves getting the job done through others. Environmental health administration is as complex as the nature and causes of the problems. Program administration impacts the status of health of the public, the quality of the environment, as well as the economy.

An effective environmental health administrator must understand the nature of the field of environmental health practice, the relationship to other health and environmental issues, the scope of problems subsumed by environmental health, the arsenal of useful program activities available, the various environmental health support services, the values and benefits of environmental health, the components of a vision for environmental health, the mission and goal of environmental health; risk assessment, public health assessment, risk communication and risk management; the need to prioritize environmental health problems, organizational issues and responsibilities, program design, the primacy of prevention, and personnel competency needs, as well as understanding the technical and scientific basics of environmental health. Program administration requires an informed and supportive citizenry; the data necessary to measure and understand problems and trends; rational policies and legislation; and budgets prioritized to deal with significant problems.¹ Those involved in administering environmental health are challenged to ensure that public demands are balanced with sound science.

Who Administers Environmental Health?

Most environmental health practitioners are involved in some degree of administration. Even at the journeyman level, personnel administer some component of one or more environmental health programs. As individuals achieve greater responsibility, they become

more fully involved in administration. Personnel at higher organizational levels may spend most or all of their time dealing with administrative matters.

What Is This Environmental Health Business, Anyway?

*Environmental health is the art and science of protecting against environmental factors that may adversely impact human health or the ecological balances essential to long term human health and environmental quality. Such factors include, but are not limited to air, food and water contaminants; radiation; toxic chemicals; wastes; disease vectors; safety hazards; and habitat alterations.*²

Public and scientific interest in environmental health has been intense since the advent of Earth Day, and the scope and complexity of environmental health have expanded.³

The terminology "environmental health" also includes environmental protection. The two terms have been utilized to denote programs based on different organizational settings rather than logical or definable differences in programs, missions or goals. Distinctions are largely artificial, and have led to organizational confusion, programmatic gaps and overlaps, and separation of closely related activities which share the common goal of protecting the public's health. The separate terms have created divisive administrative barriers rather than building cooperative bridges between the numerous organizations involved in the common goal of protecting the health of the public.⁴

How Does Environmental Health Relate To Other Health Services?

Environmental health is one of two basic components of the field of public health, the other being personal public health. Environmental health services are essential components of

the continuum of health services, and are precursors to the efficacy of the other components of the health services continuum. Other health services include personal public health services (population based disease prevention and health promotion), as well as health care (diagnosis, treatment, and/or rehabilitation of a patient under care on a one-on-one basis).⁵

Figure 1 here. This indicates examples of issues comprising some major components of the health services continuum.⁶

What Problems Are Included In Environmental Health Administration?

Environmental health administration is based on risk assessment, risk communication and risk management applied to one or more of the following problems⁷:

- | | |
|-------------------------------------|-----------------------------------|
| Ambient air quality | Health care facilities |
| Indoor air quality | Day care facilities |
| Radon | Correctional facilities |
| Asbestos | Unintentional injuries |
| Community noise pollution | Body art establishments |
| Radiation | Amusement parks |
| Tanning parlors | Temporary mass gatherings |
| Water pollution | Migrants workers health |
| Safe drinking water | Swimming pools and spas |
| Liquid wastes | Beaches |
| Cross-connections | Parks and recreational areas |
| Eating and drinking establishments | Solid waste |
| Food wholesalers | Hazardous waste |
| Food retailers | Toxic chemicals |
| Itinerant food establishments | Lead poisoning |
| Fish sanitation | Pesticides |
| Shellfish production and sanitation | Fertilizers |
| Pure food control | Weeds |
| Slaughterhouses | Hazardous spills |
| Poultry processing | Brownfields |
| Milk sanitation | Underground leaking storage tanks |
| Industrial hygiene and safety | Insects and rodents |
| Disaster planning and response | Nuisances |
| Bioterrorism | Animal bites |
| Healthful housing | Global warming |
| Educational facilities | Stratospheric ozone depletion |

Global toxification

What Program Activities Serve To Prevent Or Ameliorate The Foregoing Problems?

Surveillance, sampling, monitoring

Regulation, including:

- Warnings
- Administrative hearings
- Permits
- Grading
- Compliance schedules
- Variances
- Injunctions
- Administrative and judicial penalties
- Embargoes
- Environmental impact requirements
- Court preparation/testifying

Inspection

Complaint response

Consultation

Networking and community involvement

Pollution prevention

Plan and design review

Economic and social incentives

Public information and education

Problem prioritization

Public policy development and implementation

Program marketing

Strategic planning

Planning for Environmental Health for prevention through effective involvement during the planning, design and implementation stages of:

- Energy production and utilization
- Land use
- Transportation systems
- Resource development and consumption
- Product and facility design

What Program Support Services Are Necessary?

Epidemiology

Laboratory

Legal

Geographic information systems
Personnel training
Information technology
Research

Should Ecological Issues Be Addressed?

Environmental health programs have traditionally been justified, designed, and administered based narrowly on public health rationale. As environmental problems, priorities, public perception and involvement, goals, and public policy have evolved, ecological considerations have become increasingly important. Whatever long-term health threats exist, the public and public policy leaders also know that pollution kills fish, limits visibility, creates foul stench, ruins lakes and rivers, degrades recreational areas, and endangers plant and animal life.⁸

The U.S. Environmental Protection Agency's Science Advisory Board publication, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, states:

... there is no doubt that over time the quality of human life declines as the quality of natural ecosystems declines ... over the past 20 years and especially over the past decade, EPA has paid too little attention to natural ecosystems. The Agency has considered the protection of public health to be its primary mission, and it has been less concerned about risks posed to ecosystems... EPA's response to human health risks as compared to ecological risks is inappropriate, because, in the real world, there is little distinction between the two. Over the long term, ecological degradation either directly or indirectly degrades human health and the economy... human health and welfare ultimately rely upon the life support systems and natural resources provided by healthy

*ecosystems.*⁹

What Are Some Of The Values and Benefits of Environmental Health?

- reduced disease and disability
- reduced health care costs
- enhanced economic status,
- enhanced productivity,
- enhanced educational achievement,
- less social problems,
- a more livable environment, and
- improved quality of life

What Are Some Components Of A Vision For Environmental Health?

- Communities in which environmental health measures contribute substantially to preventing disease and disability, as well as reducing health care costs.
- Communities in which environmental health is considered to be an important entitlement for the common good of all residents and visitors.
- Communities in which environmental health problems are measured and defined prior to designing and implementing control measures.
- Communities in which environmental health efforts are based on risk assessment, risk communication and risk management.
- Communities in which the primacy of environmental health prevention measures is understood and practiced.
- Communities in which environmental health measures are designed for optimal net impact rather than zero risk.
- Communities in which ecological considerations are understood to be components of environmental health because, in the long run, a deteriorated environment is a threat to public health and the economy.

- Communities in which citizens understand that a quality environment is an important factor in economic vitality and productivity.
- Communities in which environmental health outcomes contribute to minimizing social problems.
- Communities in which the quality of the environment contributes to educational achievement.
- Communities in which quality life is enhanced by effective environmental health services.
- Communities in which environmental health practitioners possess the broad array of competencies necessary to lead in addressing the community's environmental health problems.
- Communities in which broad environmental health communication bridges are constantly traveled by the public, the media, and policy makers.
- Communities in which public policy leaders seek the input of environmental health practitioners prior to developing policy impacting environmental health.
- Communities in which environmental health agencies have missions of protecting public health and environmental quality rather than missions of protecting and promoting the interests of a limited segment of society.

The environmental health mission, goal, objectives, program design, priorities and public support should be based on the foregoing elements of a vision.

What Is The Mission Of Environmental Health?

Environmental health agencies should have missions of administering services in such a manner as to protect the health of the public and the quality of the environment.

Environmental health administrators should also stimulate action in such related areas long range community planning, recycling programs, zoning ordinances, plumbing codes, building codes, waste systems, economic development, energy conservation, land-use, and transportation systems.

Agencies such as agriculture departments have missions of promoting and protecting specific industries. Conflicts of interest occur when missions are mixed, thereby resulting in the familiar "fox in the henhouse" syndrome. Such conflicts of interest result in the public being defrauded rather than receiving the protection they deserve. If environmental health administrators do not articulate and adhere to a mission of protecting the health of the public and the quality of the environment, they may end up actually protecting or promoting the interests of those they are charged with regulating.

What is The Goal of Environmental Health?

The goal of environmental health is to ensure an environment that will provide optimal public health and safety, ecological well-being, and quality of life for this and future generations.

What about Risk?

Everything in environmental health is based on risk assessment, risk communication, and/or risk management applied to one or more environmental problems. The issue of how risk is assessed, communicated and managed is among the most critical environmental health problems faced by society. Public perception drives the actions of elected officials. However, public perception of environmental health priorities and problems frequently differs from that of environmental health scientists.

We do not live in a risk-free society or environment. Therefore, the environmental health

administrator must pursue net societal benefit rather than "zero-risk." The pursuit of zero-risk is frequently unnecessary, economically impractical, unattainable, and may create unfounded public concern when zero-risk is not attained. The pursuit of zero-risk as a goal for one issue may also preclude resource availability to deal with more important priorities.

Those administering environmental health programs must understand that the public is barraged with "catastrophe-of-the-week" information regarding environmental risk coupled with a paucity of critical scientific inquiry. There would be many times the actual morbidity and mortality if all the predicted catastrophes were factual. Administrators should be scientifically critical, routinely questioning policies, standards, and regulations as well as proposals to insure that all measures reflect scientifically valid priorities and needs.

What Is Risk Assessment?

Considering the serious differences in perceived priorities between scientists and those of the public and political leaders, risk assessment is an administrative issue to be understood and practiced by all interests involved in protecting the health of the public and the quality of the environment. The U.S Environmental Protection Agency's Science Advisory Board has defined risk assessment as the process by which the form, dimension, and characteristics of risk are estimated.¹⁰ Utilizing sound scientific principles to assess risk is vital to communicating risk, recommending priorities, designing and administering risk management programs, budgeting, and program evaluation.

Risk assessment has always been utilized informally and even intuitively by public policy makers and environmental health administrators. Utilizing risk assessment mathematical models has been a comparatively recent development. Whenever a decision or recommendation has been

made to develop a policy or manage an environmental problem based on available information, a formal or informal risk assessment has been performed. Frequently, environmental health administrators must make major emergency decisions based on incomplete but compelling information without having the luxury of waiting until incontrovertible evidence is available.¹¹ This practice is performed daily by environmental health practitioners managing such risks as food, water, air, radiation, wastes, toxic chemicals, noise, and unintentional injuries.

Risk assessment models generally follow the most conservative estimates that can be defended. The uncertainties in the degree of risk are frequently significant, and many issues in risk assessment can only be determined judgmentally. It has been shown that by taking nearly all relevant information about the test chemicals into consideration, a group of scientists correctly predicted the outcome at a higher success rate than computer-assisted models.¹² Risk assessment remains as much an art as a science, and risk assessment models need significant improvement.

Personnel involved in risk assessment procedures rely on knowledge and skills gleaned from such fields as chemistry, epidemiology, toxicology, biology, engineering, geology, hydrology, statistics, meteorology and physics. The practice of risk assessment is, therefore, multidisciplinary and interdisciplinary in nature. Risk assessment procedures are commonly practiced by a team of individuals representing a spectrum of required competencies. Few jurisdictions have adequate multidisciplinary capacity to conduct and implement formal risk assessment.

Risk assessment is only one of the factors used to determine priorities. Other vital considerations include public health assessments, social and economic factors, technical

feasibility, and community expectations. In the final analysis, major priorities are determined at the political levels.

What Is Public Health Assessment?

The Agency for Toxic Substances and Disease Registry has developed and emphasized the use of public health assessments in an effort to improve understanding of the actual public health impact of environmental exposures and develop realistic solutions. Such public health assessments are increasingly being used to evaluate human health risk. They provide compelling additional information, as they provide direct measures of human exposures rather than the hypothetical and statistical findings of risk assessments. Public health assessments are based on the data from representative biologic samples and personal monitoring and, therefore, are targeted at actions directly related to the exposure. Public health assessments have enhanced interactions with individuals and communities, and have improved public health decisions and actions.¹³

What Is Risk Communication?

In the absence of timely and effective risk communication to the general public, various interest groups, official agencies, industry, and public policy makers such as elected officials, risk assessment is merely academic. The utilization of risk assessment inherently requires effective risk communication if findings are to be utilized. Official pronouncements and the distribution of public information materials should not be confused with the art of risk communication.

Environmental health administrators must develop and demonstrate effective risk communication skills. Lack of such communication results in priorities and policies that differ

considerably from those based on good environmental health science. Effective risk communication requires complete openness throughout the planning and decision process, as well as embracing, including and involving appropriate interest groups. Failures in risk communication are frequently linked to the failure to involve the public early and openly discuss the needs, assumptions, alternatives, and data on which problems have been assessed and public health assessments conducted¹⁴. Risk communication, like risk assessment, is multidisciplinary and interdisciplinary involving such disciplines as sociologists, political scientists, educators, and marketing professionals.

Effective risk communication requires a continuing relationship between the agency and the public even in the absence of risk communication crises. Risk communication on a single-issue crisis basis is doomed to be less than optimal.

What Is Risk Management?

Risk management constitutes those myriad measures designed to deal with risk which has been assessed. All environmental health personnel routinely manage risk, but may not use that terminology. Risk management is the process of integrating the results of risk assessment with economic, social, political and legal concerns to develop a course of action to prevent a problem, or solve an existing problem. Risk management methodologies include developing policies, establishing priorities, enacting statutes, promulgating regulations and standards, surveillance, inspection, permitting, epidemiological investigation, public hearings, public information, developing public support, administrative orders, grading, embargoes, citations, regulation, court orders, administrative and court penalties, among others.

What About Priorities?

We do not live in a zero-risk society, and it is essential that limited resources be utilized to address the higher priority problems. The environment and the health of the public will be best served by prioritizing problems based on the best of epidemiology, risk assessment, public health assessment, cost-benefit analyses, public involvement coupled with sound professional judgment.

Congress, as well as state and local legislative bodies, has funded our nation's various environmental health programs with little regard for risk or priority. "The Health Scientist Survey: Identifying Consensus on Assessing Human Health Risk", conducted by the Institute for Regulatory Policy of nearly 1,300 professionals in the fields of epidemiology, toxicology, medicine and other health sciences, indicated that over eighty-one percent (81%) of the professionals surveyed believed that public health dollars for reduction of environmental health risk were improperly targeted¹⁵. For many years, the U.S Environmental Protection Agency (EPA) and many other federal, state and local agencies have attempted to request and allocate resources on the basis of relative risk, and EPA is now placing increased emphasis on ecological risk¹⁶.

EPA's Science Advisory Board report, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, listed ambient air pollution, worker exposure to chemicals, indoor pollution and drinking water pollutants as the major risks to human health. While not EPA programs, food protection, unintentional injuries, and childhood lead poisoning (in specified areas) should be added to this list in accordance with any reasonable public health priority.

As risks to the natural ecology and human welfare, *Reducing Risk* listed habitat alteration and destruction; species extinction and overall loss of biological diversity; stratospheric ozone

depletion; global climate change; herbicides/pesticides; toxics, nutrients, biochemical oxygen demand and turbidity in surface waters; acid deposition; and airborne toxics.

What Should Determine Environmental Health Organizational Responsibility?

- Services must be based on public health needs, justified by public health standards, and pursue public health goals no matter the title of the administering agency.
- Services should be organized in a limited number of agencies for purposes of effectiveness, efficiency and economy.
- Services should have visible organizational status that provides access to elected officials, the media, and advocacy groups.
- Services should be organized so as to have ease of interagency communication with agencies and interests such as public works, waste management, planning, economic development, transportation, energy development and production, and natural resources.
- Services must have adequate epidemiology, laboratory, computer technology, public information, and legal support services.
- Services must have must have sound statutory bases.
- Services must have a mission of public and environmental protection rather than environmental utilization and development so as to ensure freedom from conflicts of interest.

What Organizations Deliver Environmental Health Services?

Federal Agencies?

In addition to the U.S. Environmental Protection Agency, other significant federal environmental health agencies include the Occupational Safety and Health Administration of the U.S. Department of Labor, the U.S. Public Health Service (including the National Institute of

Environmental Health Sciences, the Centers for Disease Control and Prevention, the Indian Health Service, the Food and Drug Administration, the Agency for Toxic Substances and Disease Registry, and the National Institute for Environmental Health and Safety), the U.S. Coast Guard, the Geological Survey, the National Oceanographic and Atmospheric Administration, the Nuclear Regulatory Commission, the Corps of Engineers; and the Departments of Transportation, Agriculture, and Housing and Urban Development.

State Agencies?

A study conducted by the Johns Hopkins School of Public Health under contract with the USPHS Bureau of Health Professions, revealed that at least 85% of state level agencies other than state health departments.¹⁷ This percentage has undoubtedly increased since the study was made. Every state indicated that multiple agencies were involved in environmental health activities. Data from the Johns Hopkins study, coupled with data published by the Public Health Foundation¹⁸, also suggest that state expenditures for environmental health approximates that of all other public health activities combined. Another study conducted by the University of Texas School of Public Health leads to similar conclusions.¹⁹ It is clear that environmental health is the largest single component of the field of public health. Regardless of titles, environmental health agencies are components of the broad field of public health as their programs fall within any common definition of environmental health and are based on attaining public health goals. Such state agencies have various titles such as environment, environmental protection, ecology, labor, agriculture, environmental quality, natural resources, and pollution control.

In general, state environmental health agencies are apt to have responsibility for administering water pollution control, air pollution control, solid waste management, public

water supplies, meat inspection, occupational health and safety, pesticide regulation, and radiation protection.²⁰

Local Agencies?

The majority of local environmental health administration remains the responsibility of local health departments. Local activities tend to differ from those assigned state agencies, and focus on such programs as food protection, swimming pool inspection, lead poisoning, on-site liquid waste disposal, groundwater contamination, asbestos surveillance, water supplies, animal/vector control, radon testing, illegal dumping, hazardous materials spills, emergency response planning, health impact statements, and nuisance abatement. A few local jurisdictions administer comprehensive indoor and ambient air pollution control programs. Some local health departments indicate activities in water pollution control, solid waste management, radiation control, and hazardous waste management.^{21, 22}

Most local governments have assigned certain environmental health functions to agencies such as public works, housing, planning, councils of government, solid waste management, special purpose districts, and regional authorities.²³

A number of jurisdictions have authorized local environmental health departments, and many important responsibilities have also been assigned to local and regional agencies **other** than traditional local health departments. The 1996 “Survey on the Organization of Local Environmental Departments” conducted by Public Technology, Inc., revealed that agencies **other** than local health departments are playing an increasing role in such environmental health areas as air pollution control, noise pollution control, water pollution control, groundwater contamination, industrial discharges, accidental spills, fish and shellfish sanitation, drinking

water contamination, brownfields clean-up and redevelopment, hazardous materials control, leaking fuel storage tanks, hazardous waste sites, and pollution prevention.

Diversification of environmental health responsibilities occurred and continue to occur for a variety of reasons, but they share one important commonality. That commonality is the ever increasing priority and complexity of environmental health problems and programs.

Environmental health has arrived. Environmental health has developed its own constituency.

Environmental health is demanded by the public and is widely considered to be an entitlement.

The public health delivery system has evolved from traveling on a single health department track, to traveling on an environmental health track and a personal public health track.

Environmental health practitioners should seek roles in various agencies involved in the comprehensive field of environmental health. The Science Advisory Board of the American Public Health Association developed the following definitions to better identify the increasing organizational diversity of public health services:

*A Local Health **Department** is a statutorily designated agency of local government that includes the words “health department” in its title and is charged with delivering identifiable services designed to prevent or solve health problems.*

*A Local Health **Agency** is a statutorily designated agency of local government charged with delivering identifiable services designed to prevent or solve health problems.*

Federal, State, or Local?

Environmental health services should be administered as close to the people as possible.

Local agencies can do a better job of protecting the local environment than can a distant

bureaucracy.²⁴ Principles that have determined responsibilities of levels of government include:

- Problems of an interstate nature such as interstate protection of food and food products,

interstate solid and hazardous wastes transportation, interstate water pollution control, interstate pesticide regulation, interstate air pollution resolution are administered by appropriate federal agencies.

- The federal government has retained partial or sole authority to administer many activities that have been federally mandated or funded including, but not limited to, certain aspects of radioactive waste management, water pollution control and facilities construction, air pollution control, meat inspection, occupational safety and health, and safe drinking water. State and local governments have frequently accepted primacy for administering some of these activities subject to adhering to federal requirements.
- State agencies or special districts may find it easier to administer certain issues on a problem-shed basis rather than on a limited local jurisdiction basis. Examples include water pollution control, air pollution control, solid waste management, and milk sanitation.
- In sparsely populated states as well as rural areas of some other states, the state agency may exercise direct administrative authority in all program areas.
- Many state agencies provide technical and consultative support to local environmental health agencies.
- State agencies, as well as federal agencies, may develop criteria, standards, and model legislation for state and/or local adoption.
- State agencies administer state and federal grant-in-aid funds for local agencies.
- There may be a conflict of interest when local environmental health agencies attempt to regulate local government proprietary functions such as public water supplies, solid waste disposal, and sewage treatment.

- Smaller local agencies may not have expertise in certain specialized areas such as epidemiology, toxicology, public health assessment, and risk assessment.

Why Organizational Diversification?

The trend to organizationally diversify environmental health programs will continue in response to the priority of environmental health and protection, the demands of environmental advocates, and the trend for many health departments to become significantly involved in health care to the detriment of environmental health and other public health priorities. It is unrealistic to develop programmatic relationships between water pollution control, for example, and any one of a number of health care (treatment and rehabilitation) programs. Increased health care responsibilities of federal, state, and local health departments may translate into inadequate understanding, leadership and priority for environmental health within health departments.²⁵ Additionally, many health departments find it difficult to deal with the ecological aspects of environmental health.

Such organizational diversification does not mean that environmental health is not a basic component of public health. While each community or state has only one health department, every community and state has several other public health agencies including numerous agencies delivering environmental health services. Environmental health administrators should help ensure that the programs administered by such agencies are comprehensive in scope; based on sound epidemiology, toxicology, public health assessment, and risk assessment data; and help ensure that they have adequate legal, fiscal, laboratory, epidemiological and other support resources to be effective.

How Are Programs Designed?

An environmental health program is a rational grouping of activities designed to solve one or more problems. An environmental health problem is a reasonably discrete environmental issue having an impact on human health, safety, or the quality of the environment.

Program activities include elements of surveillance, sampling, analyses, inspection, public information, planning for environmental health, pollution prevention, regulation, epidemiology, public health assessment, risk assessment, education of target groups, demonstrations, consultation, training, research, plan and design review, economic and social incentives, warnings, communication, hearings, permits, grading, compliance schedules, variances, injunctions, administrative and judicial penalties, embargoes, and environmental impact statements.

Problems must be accurately defined as to cause, time of day or season, geographic area, nature, intensity, and public health and environmental effects prior to designing the program. Program design must stand the scrutiny of critical evaluation to ensure that the design will prevent or solve the problem(s) in an economical and socially acceptable manner.

The net health, environmental, social, and economic impacts of proposed requirements must be thoroughly evaluated prior to implementation. One seemingly desirable measure may result in undesirable problems of a more serious nature than the problem for which the program was intended.

Most environmental health programs have been developed to address a single problem. This has led to unnecessary inefficiencies and ineffectiveness along with poor utilization of personnel and other resources. Properly designed, a program can address components of several environmental health problems. This design practice is common in such programs as food

protection, institutional environmental control, environmental control of recreational areas, and occupational safety and health.

What Are Program Support Elements?

All organizations require such administrative support elements as fiscal, audit, purchasing, budget, and personnel. A number of environmental health support functions are essential to the administration of environmental health services.

What about Laboratory Support?

Comprehensive laboratory support must be available in quantity and quality for epidemiological investigations, public health assessment, risk assessment, determining environmental trends and needs, developing standards and regulations, enforcement, public information, and program design. Such services are available through public health laboratories, environmental laboratories, pollution control laboratories, agriculture laboratories or, in a few jurisdictions, comprehensive laboratories serving various governmental agencies. At the federal level, more specialized services may be requested from the Centers for Disease Control and Prevention, the Environmental Protection Agency, and the Food and Drug Administration.

What about Epidemiology?

Environmental epidemiology is a specialized epidemiological function that deals with extrapolations and correlations as well as direct cause-and-effect investigations. Early day environmental health practice was geared primarily to communicable disease problems. Now, it also embraces the impacts of increasing amounts, types, and combinations of non-living contaminants and other stresses. Such impacts are more subtle and long range in their effects. There is greater difficulty in measuring effects as well as in precisely isolating and understanding

the cause(s).

Some state and local environmental health agencies that do not have in-house epidemiological support must receive such services through another agency, usually a health department. Sound environmental surveillance data and epidemiology are essential to determine needs, trends, priorities, and to design effective programs.

What about Legal Services?

Environmental health programs are authorized by legislative bodies at various levels of government, and provide for legal remedies when other efforts do not provide for compliance with specified requirements. When regulatory remedies are pursued, the advice, support and involvement of legal counsel is desirable.

Many environmental health agencies have specialized environmental law attorneys. Others may request assistance through the office of a city or county attorney, a state attorney general, or the U.S. Department of Justice, depending on the type of requirement(s). The involvement of a skilled legal draft person is also essential when legislation is being drafted.

What About Public Information?

Environmental health is the public's business, and will not be properly understood or supported in the absence of continuing public information. While all environmental health administrators should be involved in these activities, it is appropriate that the agency utilize staff specifically skilled in assuring a free flow of information and the attainment of new skills by the public, including the news media, target groups, citizen groups, professional groups, elected officials, and other agencies involved in the field of environmental health.

What About Research?

Environmental health programs cannot be properly justified, prioritized, budgeted, designed, implemented or administered without the benefits of peer reviewed research. Research is essential to the development of new methodologies for preventing and controlling problems, environmental remediation, analyses, and educating target groups.

Most operating agencies and practitioners are not well equipped to conduct research, but should be vital participants in the processes of identifying research needs and routinely communicating these needs to appropriate research institutions. The knowledge and skills of practitioners will be enhanced through continuing communication and coalitions with academic programs and individuals involved in environmental health education and research.

What About Data?

Environmental health surveillance data are currently inadequate. These data should include environmentally related morbidity and mortality, specified environmental contaminant and pollution levels, and other environmental/ecological conditions.

State-of-the art environmental health information systems would enhance the level of informed administration at all levels of government and industry.²⁶

What About Fiscal Support?

Environmental health administrators find it necessary to be creative in funding services. Activities must be evaluated and prioritized to address the more significant priorities within the jurisdiction. Where additional general fund support is not available, administrators must consider reallocating budgets from lower priority activities, or developing new sources of revenue such as fees for service and/or pollution taxes and other market based incentives.

Prioritizing funding requests requires the best skills in administration, epidemiology,

public health assessments, and risk assessment. Developing creative funding mechanisms will require that administrators have basic knowledge and skills in public finance. Marketing such budget requests requires competencies in marketing, communication, and public policy.

What about the Primacy of Prevention?

EPA's Science Advisory Board publication *Reducing Risk* states:

...end-of-pipe controls and waste disposal should be the last line of environmental defense, not the front line. Preventing pollution at its source - through the redesign of production processes, the substitution of less toxic production materials, the screening of new chemicals and technologies before they are introduced into commerce, energy and water conservation, the development of less-polluting transportation systems and farming practices, etc. - is usually a far cheaper, more effective way to reduce environmental risk, especially over the long term...

Pollution prevention also minimizes environmental problems that are caused through a variety of exposures. For example, substituting a non-toxic for a toxic agent reduces exposures to workers producing and using the agent at the same time as it reduces exposures through surface water, groundwater, and the air.

Pollution prevention also is preferable to end-of-pipe controls that often cause environmental problems of their own. Air pollutants captured in industrial smokestacks and deposited in landfills can contribute to groundwater pollution; stripping toxic chemicals out of groundwater, and combusting solid and hazardous wastes, can contribute to air pollution. Pollution prevention techniques are especially promising because they do not move pollutants from one environmental medium to another, as is

*often the case with end-of-pipe controls. Rather, the pollutants are not generated in the first place.*²⁷

Do We Need To Plan For Environmental Health?

Planning for environmental health (as differed from program planning) is a fundamental prevention function. While environmental health should be grounded on prevention, a preponderance of efforts and funds are currently devoted to remediation of contamination and pollution created as a result of earlier actions taken by other interests in the public and private sectors.

Environmental health administrators must have the knowledge, skills and authority to become effectively involved in prevention during the planning, design and construction stages of energy development and production, land use, transportation methods and systems, facilities, resource development and utilization, and product design and development. Developing the capacity and authority to function effectively in planning for environmental health is necessary for environmental health administrators to function in a primary prevention mode, rather than secondary prevention or environmental remediation after the contamination or pollution has been produced and emitted.

Building and Traveling Bridges?

Effective environmental health administration depends on developing and utilizing constantly traveled communication bridges and network processes connecting a wide variety of groups and agencies involved in the struggle for a quality environment and enhanced public health. A few such interests include land use, energy production, transportation, resource

development, the medical community, public works officials, agriculture, conservation, engineering, architecture, colleges and universities, economic development, chambers of commerce, environmental groups, trade and industry groups, and elected officials. These relationships should be dictated by organizational policy rather than being left to chance or personalities.

What Are Personnel Competency Needs?

Environmental health, like other components of public health, is not a profession or a discipline. It is a cause and a field engaged in by a wide array of personnel practicing within a broad and diverse spectrum of individuals, groups, and agencies.

The field of environmental health requires the involvement of scores of disciplines as well as interdisciplinarily trained personnel. Personnel function in roles ranging from routine inspection and surveillance levels through administration, policy, education and research components. Depending on the type of agency and sophistication of programs, effective efforts demands an alliance of physical scientists, life scientists, social scientists, educators, physicians, environmental scientists, engineers, data specialists, planners, administrators, laboratory scientists, veterinarians, attorneys, economists, political scientists, and others in order to fully utilize the variety of environmental health activities.

Environmental health personnel may be grouped as environmental health and protection professionals, and professionals in environmental health and protection.²⁸

Environmental health professionals are those who have been educated in the various environmental health and protection technical areas, as well as in epidemiology, biostatistics, toxicology, administration and public policy, risk assessment, communication, public health

assessment, risk management, environmental law, and environmental finance. Such professionals are typically graduates of environmental health science and protection programs accredited by the National Environmental Health Science and Protection Accreditation Council^{29, 30}, or of schools of public health or programs accredited by the Council on Education for Public Health.³¹

Professionals in environmental health include other essential professionals and disciplines such as epidemiologists, biostatiticians, toxicologists, chemists, hydrologists, geologists, biologists, physicians, attorneys, administrators, economists, political scientists, educators, engineers, meteorologists, and social scientists.

The EPA Science Advisory Board publication, *Reducing Risk*, states that:

The nation is facing a shortage of environmental scientists and engineers needed to cope with environmental problems today and in the future. Moreover, professionals today need continuing education and training to help them understand the complex control technologies and pollution prevention strategies needed to reduce environmental risks more effectively.

....Most environmental officials have been trained in a subset of environmental problems, such as air pollution, water pollution or waste disposal. But they have not been trained to assist and respond to environmental problems in an integrated and comprehensive way. Moreover, few have been taught to anticipate and prevent pollution from occurring or to utilize risk reduction tools beyond command-and-control regulations. This narrow focus is not very effective in the face of inter-media problems that have emerged over the past two decades and that are projected for the future.

Competencies for environmental health and protection professionals as practitioners

should include:^{32 33}

- relevant environmental health and protection sciences such as biology, chemistry, physics, geology, ecology and toxicology
- environmental health and protection technical issues
- epidemiology and biostatistics
- etiology of environmentally induced diseases
- risk assessment
- public health assessment
- risk communication
- risk management
- marketing
- interest group interactions
- personnel, financial, and program administration
- organizational behavior
- public policy development and implementation
- planning for environmental health
- cultural issues
- strategic planning
- fiscal impacts of environmental health activities
- environmental health law
- federal, state and local environmental health organizations
- federal, state, and local political processes

Can We Afford Not To Ensure Continuing Education?

Continuing education is an essential component of a career, not only to be effective, but personnel learn more readily as they encounter specific needs. Continuing environmental health education should be budgeted, timely, relevant, economical and convenient, as well as strongly supported by management.

What about the Future of Environmental Health?

Environmental health administration will continue to increase in complexity, and the public will continue to expect and demand appropriate services.

Demographic changes, resource development and consumption, product and materials manufacture and utilization, wastes, global environmental deterioration, technological

development, changing patterns of land use, transportation methodologies, energy development and utilization, and continuing organizational diversification of environmental health will create additional and unanticipated challenges. Environmental health administrators inculcated with appropriate competencies will be critical to the success of environmental health services.

REFERENCES

1. Committee on the Future of Environmental Health, National Environmental Health Association. 1993. "The Future of Environmental Health, Part One." *Journal of Environmental Health* 55 (4):28-32.
2. Committee on the Future of Environmental Health, National Environmental Health Association. 1993. "The Future of Environmental Health, Part One." *Journal of Environmental Health* 55 (4):28-32.
3. Gordon, Larry J. 1990. "Who Will Manage the Environment?" *American Journal of Public Health*, August, 80: 904-905.
4. Gordon, Larry J. and McFarlane, Deborah R. "Public Health Practitioner Incubation Plight: Following the Money Trail," *Journal of Public Health Policy*. Vol.17 No.1 (1996): 59-70.
5. Health Resources and Services Administration, Public Health Service, U.S. Department of Health and Human Services. 1991. *Educating the Environmental Health Science and Protection Work Force: Problems, Challenges, and Recommendations*. Bureau of Health Professions, Rockville, MD.
6. McFarlane, Deborah, and Larry Gordon. "Teaching Health Policy and Politics in U.S. Schools of Public Health." *Journal of Public Health Policy* 13(4):428-434.
7. Gordon, Larry J. "Environmental Health and Protection: Century 21 Challenges," *Journal of Environmental Health*. Vol. 57, No. 6 (Jan/Feb 1995): 28-34.
8. Committee for the Study of the Future of Public Health, Division of Health Care Services, Institute of Medicine. *The Future of Public Health*. Washington, DC: National Academy Press, 1998.
9. U.S. Environmental Protection Agency, Science Advisory Board. 1990. *Reducing Risk: Setting Priorities And Strategies For Environmental Protection*. U.S. Environmental Protection Agency, Washington, DC.

10. U.S. Environmental Protection Agency, Science Advisory Board. (1990). *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. U.S. Environmental Protection Agency, Washington, D.C., p. 2.
11. Gordon, Larry J. "Risk Analysis," *McGraw-Hill Yearbook of Science and Technology*, 1995. McGraw-Hill, Inc. 1995.
12. Hileman, Bette. 1993. "Expert Intuition Tops in Test Of Carcinogenicity Prediction." *Chemical and Engineering News* 71(25):35-37.
13. Abraham, John E., Williams, Robert C. "Enhancing Risk Management and Public Health Decisions Through Exposure Investigations," unpublished paper, Agency for Toxic Substances and Disease Registry, Atlanta, GA.
14. Gordon, Larry J. "Risk Analysis," *McGraw-Hill Yearbook of Science and Technology*, 1995. McGraw-Hill, Inc. 1995.
15. Institute for Regulatory Policy. 1991. *The Health Scientist Survey: Identifying Consensus on Assessing Human Health Risk*. Institute for Regulatory Policy, Washington, DC.
16. U.S. Environmental Protection Agency, Science Advisory Board. (1990). *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. U.S. Environmental Protection Agency, Washington, D.C.
17. Burke, Thomas A., Shalauta, Nadia M., and Tran, Nga L. *The Environmental Web: Services, Structure, Funding*. U.S Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Public Health Branch. Rockville, MD, January 1995.
18. Public Health Foundation. *Public Health Agencies 1991: An Inventory of Programs and Block Grant Expenditures*. Public Health Foundation, Washington, DC, December 1991.
19. Center for Health Policy Studies. *The Professional Public Health Workforce in Texas*. University of Texas School of Public Health, Houston, TX. 1996.
20. Gordon, Larry J. 1993. "The Future of Environmental Health, and The Need For Public Health Leadership." *Journal of Environmental Health* 56(5):38-30
21. National Association of County Health Officials. 1990. *National Profile of Local Health Departments*. National Association of County Health Officials, Washington, DC.
22. National Association of County Health Officials. 1992. *Current Roles and Future Challenges of Local Health Departments in Environmental Health*. NACHO, Washington, DC.

23. National Association of County Health Officials. 1990. *National Profile of Local Health Departments*. National Association of County Health Officials, Washington, DC.
24. Browner, Carol. 1993. "Public Health -- An EPA Imperative." *EPA Insight Policy Paper*. EPA-175-N-93-025. November 1993.
25. Committee on the Future of Environmental Health, National Environmental Health Association. 1993. "The Future of Environmental Health, Part One" *Journal of Environmental Health* 55(4):28-32.
26. Roper, William L., Edward L. Baker, William W. Dyal, and Ray M. Nicola. "Strengthening the Public Health System." *Public Health Reports* 107 (6):609-615.
27. U.S. Environmental Protection Agency, Science Advisory Board. 1990. *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. Environmental Protection Agency, Washington, DC.
28. Health Resources and Services Administration, Public Health Service, U.S. Department of Health and Human Services. 1988. *Evaluating the Environmental Health Work Force*. Bureau of Health Professions, Rockville, MD.
29. National Environmental Health Science and Protection Accreditation Council. *Guidelines for Accreditation of Environmental Health Science and Protection Masters Level Graduate Programs*. Denver, CO, 1993
30. National Environmental Health Science and Protection Accreditation Council. *Guidelines for Accreditation of Environmental Health Science and Protection Baccalaureate Programs*. Denver, CO, 1992
31. Council on Education for Public Health. *Council on Education for Public Health: The Accrediting Agency for Graduate Public Health Education*. CEPH, Washington, DC.
32. Committee on the Future of Environmental Health, National Environmental Health Association. 1993. "The Future of Environmental Health." *Journal of Environmental Health* 55(5):42-45.
33. Sorensen, A., Bialek R. eds. 1993. *The Public Health Faculty/Agency Forum: Final Report*. Gainesville, FL. Florida University Press.