

PART VI

SPECIAL TOPICS

Introduction to Part VI

Part VI of this Reference Manual provides an overview of three special topics related to air toxics risk assessment.

- Public Health Assessment (Chapter 30) provides an overview of the process by which public health agencies may evaluate the public health implications posed by the emissions from air toxic sources in a community. The public health assessment, if performed, is a complementary process to risk assessment.
- Probabilistic Risk Assessment (Chapter 31) discusses the process by which probability distributions are used to characterize variability or uncertainty in risk estimates, a process aimed at describing risks as a distribution (or range) of potential outcomes.
- Use of Geographical Information Systems (GIS) in Risk Assessment (Chapter 32) provides an overview of the software and geographic data that allow efficient storage, analysis, and presentation of spatially explicit and geographically referenced information that can help in the process of conducting risk assessments and reporting results

Chapter 30 Public Health Assessment

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30.1 Introduction

An adjunct to conducting air toxic risk assessments is public health assessments, which uses public health tools (e.g., health questionnaires, epidemiology) to investigate the incidence and prevalence of disease and to find out the current or past health of individuals. While public health methods are not always used for air toxics risk assessments, they can provide useful information to answer the question of whether there is evidence that there is a public health concern, particularly if disease rates are elevated in the assessment area.

Air toxics risk assessment, the main topic of this manual, focuses on assessing the potential risk that people have for experiencing adverse health effects from exposure to air toxics. The outcome of a risk assessment is a statement about the likelihood that exposure may result in disease (e.g., the probability of people developing cancer). The risk assessment process links the potential exposures to emissions from (often) specific sources to the likelihood of disease occurring.

However, in any community, concerns about more than just estimates of the likelihood of risk often come up. For example, communities where risk assessments are being performed often express concern about current health effects that may have resulted from past exposures. Questions like “was my cancer caused by air pollution” are often on the minds of people who live where an air toxics risk assessment is being performed.

The risk assessment process, while a powerful predictive tool for evaluating public health impacts from air pollution, is not amenable to answering these types of questions. Nevertheless, questions about disease and past exposures will inevitably come up as the air toxics risk assessment study moves forward. The risk assessment and risk management team will almost always have to explain that their assessment tool (risk assessment) is not being used to answer questions about existing cases of disease.

To help risk assessors and other stakeholders respond to these types of questions, this chapter provides information on a complementary process to risk assessment called **Public Health Assessment** or **PHA**. It is taken largely from the ATSDR *Public Health Assessment Guidance Manual*.⁽¹⁾ A PHA for air toxics is an analysis and statement of the public health implications posed by a source or group of sources of air toxics on a given geographic area. It usually is conducted by a public health agency such as the Agency for Toxic Substances and Disease Registry or ATSDR (a federal Agency within the Centers for Disease Control and Prevention) or one of their partner state or local public health agencies. PHAs *are not* generally performed by EPA or state, local, or tribal air agencies since PHAs often rely on specialized medical and epidemiological expertise and due to the difficulty facing these agencies in obtaining and reviewing medical information for individuals. PHAs are normally performed:

- In response to a request by concerned community members or physicians;
- In response to a real or perceived increase in a health problem noted during routine disease surveillance systems; and/or
- As part of a broader program such as a proactive analysis of region-specific air quality.

The types of air toxics assessments most likely to include a PHA are those where the pollutants have a clearly identifiable effect, where the exposure is relatively widespread, or where there is a high level of public concern. A PHA will not necessarily be needed every place an air toxics risk assessment is performed. However, the use of the PHA process, in conjunction with the risk assessment process, is becoming a more common practice for the purpose of providing holistic evaluations of air toxics impacts on communities.

PHAs are performed by ATSDR at each Superfund site on the National Priorities List. ATSDR also performs PHAs when petitioned. The term **public health assessment (PHA)** as used here, refers to a broad range of assessment types – from screening-level health consultations to comprehensive epidemiological assessments – that are commonly performed by ATSDR in its work. The PHA process, while commonly thought of as a Superfund-related activity, is amendable to a wide range of exposure scenarios, including the evaluation of air toxics impacts at the community level.

A PHA may involve an assessment of relevant **environmental data, health outcome data** (e.g., cancer statistics), and **community concerns** generally associated with a study area where air toxics are or have been released. A PHA identifies populations living or working on or near areas for which more extensive public health actions or studies are indicated and is generally more qualitative, more focused on actual, measurable harm, and past and current exposures.

This chapter describes the history of PHAs, what they are, how they compare to and work in concert with risk assessments, and how they are conducted. Several case studies are included to help illustrate the diversity of PHAs and how they compare with and are used with risk assessments.

30.2 History of Public Health Assessment

PHA as a tool for characterizing and protecting the health of a society can be traced back thousands of years. The ancient Babylonians, Egyptians, Greeks, and Romans were among the first known civilizations to describe associations between diseases and sources such as place, water conditions, climate, eating habits, and housing. One of the first documented public health “assessments” (though later proven incorrect) connected the presence of “bad air” around swamps and marshes with the prevalence of malaria, one of the world’s most devastating diseases. (It was determined later that the prevalence of malaria was associated not with air, but with mosquitos, the transmission vector for the disease, which breed in standing water associated with those places.) Infectious diseases continued to dominate public health concerns until the industrial revolution, although the problems of poor urban air quality from the use of coal were well documented as early as the end of the 16th century.

The earliest “bad air”?



The modern use of PHA for air toxics in the U.S. probably began in the mid-1900s in response to events such as the incapacitating smog episodes in Los Angeles in the 1940s, the polluted air inversion that killed 20 people in Donora, Pennsylvania in 1948, and the atmospheric nuclear weapons tests in Nevada in the 1950s. Myriad state and local public health agencies shouldered much of the burden of air pollutant health assessment at first. Then, at the federal level, the Federal Air Pollution Control Act of 1955 authorized the Public Health Service (PHS) to conduct

research and technical assistance and work towards a better understanding of the causes and effects of air pollution.

In 1980, ATSDR was created specifically to conduct PHAs at hazardous waste (Superfund) sites. That role has expanded over time to address additional pollution sources, including air toxics. ATSDR is not a regulatory agency like EPA, but rather is a public health agency that conducts assessments and makes recommendations to EPA and others when specific actions at study areas in question are needed to protect the public's health. ATSDR conducts PHAs when petitioned by concerned community members, physicians, state or federal agencies, or tribal governments. State and local public health agencies also play an important role with regard to PHAs for air toxics and other hazards.

30.3 Relationship of Public Health Assessment to Risk Assessment

Both the PHA and the quantitative risk assessment address the potential human health effects of environmental exposures, but they use different approaches and have different purposes. As illustrated in Exhibit 30-1, the PHA tends to be less quantitative than the risk assessment and to focus more on actual past and current exposures. The PHA evaluates observed health outcome and related data (e.g., cancer clusters, breathing problems, toxics residues in biologic samples) to determine whether rates of disease or death are or could be elevated in a community and, if so, whether these outcomes are due to a specific source. The risk assessment, on the other hand, starts with a specific source and evaluates estimated potential health outcomes, or risks. The PHA's subsequent conclusions generally complement the risk assessment process and help inform the decisions that the state, tribal, or local agency is reaching about a given study area. Similarly, the risk assessment provides considerable data to the PHA.

In addition to its focus on health outcome data, such as cancer or asthma incidence, the PHA also helps put community-provided data and information and community concerns into perspective, which in turn helps both (1) the community better understand whether they have been exposed to hazardous substances and, if so, what that means in terms of possible health outcomes, and (2) the decision-maker better determine what needs to be done to prevent or further study these exposures (e.g., emissions reductions, health education, biologic monitoring).

The PHA may use similar techniques to those of the quantitative risk assessment, but primarily as tools either to clearly rule out the existence of public health hazards, to determine that a clinical disease is really likely in the community, or to identify areas for additional study. At a minimum, the PHA helps to identify a baseline in the level of disease in a community so that later studies will have a basis for comparison.

Exhibit 30-1. PHAs and Risk Assessments: Differences and Similarities

In a PHA...	In a risk assessment...
OVERALL	
More qualitative More community involvement Conduct less frequently	More quantitative Less community involvement Conducted more frequently
EXPOSURE ASSESSMENT	
Similar for air sampling and modeling Biomonitoring possible Past, current/future	Air sampling Fate/transport modeling Future/hypothetical
TOXICITY ASSESSMENT	
Similar (for health effects screening)	Similar (for toxicity)
CHARACTERIZATION	
Margin for exposure comparisons Public health implications Needed public health actions Informs the risk assessment	Modeled risk Informs the PHA

30.4 What Is Public Health Assessment?

A PHA is an evaluation of relevant **environmental data**, **health outcome data**, and **community concerns** associated with a study area where hazardous substances have been released. A PHA identifies populations living or working on or near areas for which more extensive public health actions or studies are indicated.

PHAs can range from simple to complex, with the former activity often termed a **health consultation** rather than PHA. This more simple form generally is conducted in response to a

ATSDR Definition of PHA

The evaluation of data and information on the release of hazardous substances into the environment in order to assess any [past], current, or future impact on public health, develop health advisories or other recommendations, and identify studies or actions needed to evaluate and mitigate or prevent human health effects (42 *Code of Federal Regulations*, Part 90, published in 55 *Federal Register* 5136, February 13, 1990).

specific question or request for information pertaining to a hazardous substance or facility. It often contains a time-critical element that necessitates a rapid response. More complex forms of a PHA can involve a wide geographical area, many pollution sources, and take months or years to complete.

Understanding and responding to study area-specific community health concerns is an important part of the PHA process. These investigations can be conducted to confirm case reports, determine an unusual disease occurrence, and explore potential risk factors. One frequently cited concern is the **disease cluster** – the occurrence of a specific disease or condition above the expected number for a given geographic location and time period (e.g., the high incidence of leukemia in a given area). The health agency needs to learn what people in the area know about a source and source-related exposures and what concerns they may have about its impact on their health. Therefore, starting early in the assessment process, the health agency generally gathers information and comments from the people who live or work near the source(s), including area residents, civic leaders, health professionals, and community groups. Throughout the PHA process, the health agency should communicate with the public about the purpose, approach, and results of its public health activities.

The PHA process is iterative and dynamic and may lead to a variety of products or public health actions. The findings may be communicated in public health assessment or public health consultation documents, which serve as an aid for developing additional public health actions. The audience for such products often includes environmental and public health agencies, communities, and the public health agency itself.

During the course of the PHA process, the public health agency may identify the need to prevent or better define exposures or illnesses in a particular community. The agency's response to such a need might include:

- Issuing a **public health advisory** (if there is an urgent health threat);
- Initiating an **exposure investigation** (to better define study area exposures);
- Recommending a **health study** (to identify elevated illness or disease rates in a community); and/or
- Conducting **health education** (for the study area community or health professionals within the community).

The PHA process also can serve as a triage mechanism, enabling the public health agency to prioritize and identify additional steps needed to answer public health questions. The science of environmental health is still developing, and sometimes information on the health effects of certain substances is not available. When this occurs, rendering certain questions unanswerable by the available literature, the public health agency will suggest what further research studies and/or health education services are needed.

30.5 How Is a Public Health Assessment Conducted?

PHAs generally are conducted by public health agency assessors, often supported by a multi-disciplinary team of scientists, health communication specialists, health educators, and/or medical professionals. The health agency solicits and evaluates information from other local, state, tribal, and/or federal agencies; parties responsible for operating sources at a particular study area; and the community. All of these stakeholders play an integral role in the PHA process. The public health agency promotes a team approach to ensure that information used in the assessment is accurate and up-to-date, ensure that community concerns are identified and addressed, and fosters cooperative efforts in implementing recommendations and public health activities.

Many technical resources exist that provide details about conducting a PHA (see Exhibit 30-2), and, thus, only a broad overview is provided here. One of the most comprehensive resources is the ATSDR *Public Health Assessment Guidance Manual*.⁽¹⁾ The ATSDR manual focuses on site-specific PHAs such as Superfund sites; nevertheless, it also can be used to assess air emissions within a limited geographical area. As described in detail in the ATSDR manual, the steps of a PHA — whether conducted by ATSDR or a state or local public health agency, and whether comprehensive or limited to a screening assessment — can be multifaceted and interactive. Exhibit 30-3 illustrates this by providing an overview of a typical PHA process. The following subsections describe this process in more detail.

30.5.1 Conduct Scoping

The first step is to establish an overall understanding of the study area and begin to identify the most pertinent issues. The objective is to quickly gain some baseline information about the study area and start developing a strategy for conducting the PHA. To help ensure a consistent approach across study areas, the following steps are followed during this initial phase:

- Initiate study area scoping by performing an initial review of permits and other sources of study area information, identifying any past health agency or partner activities, identifying and communicating with study area contacts, and determining the need for a study area visit to observe actual conditions and speak with study area representatives.
- Define roles and responsibilities of team members (internal and external).
- Establish communication mechanisms (internal and external) by developing a schedule for team meetings, thinking about how to present the findings of the assessment, and developing health communication strategies.
- Develop a study area strategy for completing the various steps in the PHA process and develop a strategy, identifying the tools and resources that might be needed to evaluate the study area, communicate the findings, and implement public health actions.
- Based on information obtained during study area scoping, develop an approach that focuses on the most pertinent public health issues.

Exhibit 30-2. Selected Public Health Assessment Resources

- Agency for Toxic Substances and Disease Registry (ATSDR; www.atsdr.cdc.gov), which publishes the *Public Health Assessment Guidance Manual* (current draft is available online; *Guidance for ATSDR Health Studies* (1996; available online), *Environmental Data Needed for Public Health Assessments* (1994, available online), and other guidance.
- National Institute of Environmental Health Sciences (NIEHS; www.niehs.nih.gov), which publishes *Environmental Health Perspectives* and sponsors multidisciplinary biomedical research, prevention and intervention efforts, and communication strategies that encompass training, technology transfer, and community outreach.
- American Public Health Association (APHA; www.apha.org), which publishes the *American Journal of Public Health* and provides many other resources related to environmental public health.
- National Association of County and City Health Officials (NACCHO; www.naccho.org), which publishes the *Protocol for Assessing Community Excellence in Environmental Health* (2000) and *Assessment to Action: Improving the Health of Community Affected by Hazardous Waste* (2002).
- National Association of Local Boards of Health (NALBOH) (www.nalboh.org), which maintains an up-to-date database of contact information for all local boards of health, provides technical assistance to existing boards of health, and will soon publish the *Environmental Health Primer*.

30.5.2 Obtain Study Area Information

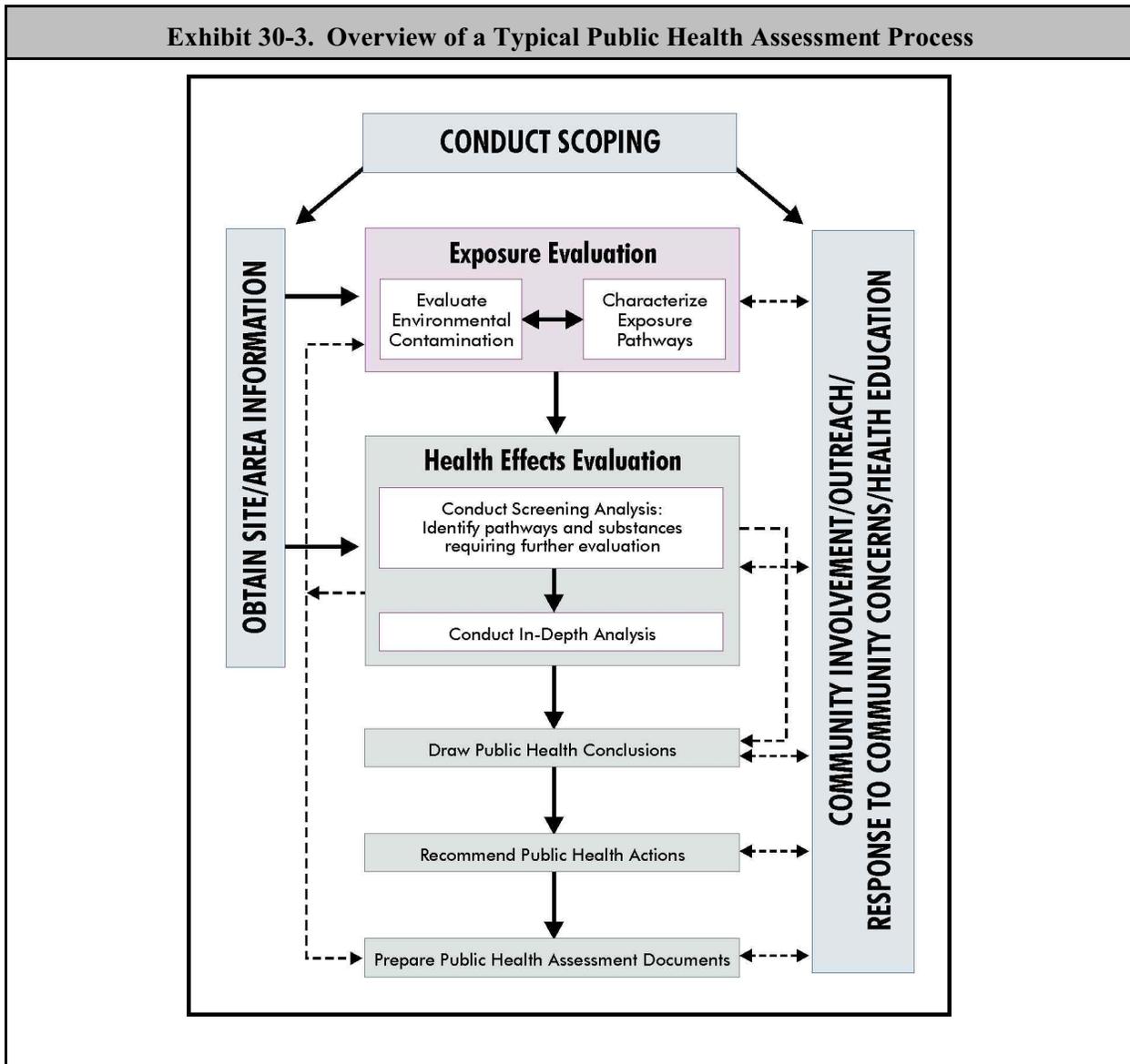
Throughout the PHA process, various team members will collect information about the study area, although the initial collection of information is typically the most intensive. Information sources typically include interviews (in-person or via telephone); study area-specific investigation reports prepared by federal, state, and local environmental and health departments; and study area visits. Gathering pertinent study area information requires a series of iterative steps, including gaining a basic understanding of the study area, identifying data needs and sources, conducting a study area visit, communicating with community members and other stakeholders, critically reviewing study area documentation, identifying data gaps, and compiling and organizing relevant data to support the assessment.

30.5.3 Community Involvement/Outreach/Response to Community Concerns

The community associated with a study area is both an important resource for and a key audience in the PHA process. Community involvement activities should be developed and implemented with the following objectives in mind:

- Earning trust and credibility through open, compassionate, and respectful communications.
- Helping community members understand what the PHA process involves and what it can and cannot do.
- Providing opportunities for communities to become involved in the PHA activities.
- Promoting collaboration between the public health agency, communities, and other agencies.
- Informing and updating communities about the health agency's work.
- Assisting communities in understanding the possible health impact of exposures to hazardous substances.

Exhibit 30-3. Overview of a Typical Public Health Assessment Process



Chapter 28 of this reference manual provides a more detailed discussion of community involvement and outreach.

30.5.4 Exposure Evaluation

For the exposure evaluation, public health assessors review environmental data to determine the sources of pollutants and exposure pathways/routes. The conceptual model described in Chapter 6 should be a reasonable starting point for the PHA exposure evaluation. Generally, the public health agency involved does not collect its own environmental sampling data, at least at first, but rather reviews information provided by federal, state, and local government agencies and/or their contractors, businesses, and the public. Assessors can indicate what further environmental sampling may be needed and may collect environmental and biologic samples when appropriate. This step involves two key substeps:

- **Evaluate Environmental Contamination Data.** This step involves determining what pollutants people may be exposed to and in what concentrations. This evaluation involves assessing the quality and representativeness of available monitoring data and measurements or modeled estimates of exposure point concentrations. This is an important way to ensure that any public health conclusions and recommendations for the study area are based on appropriate and reliable data. Both sampling data and modeling techniques described in Chapters 9, 10, 18, and 19 are sometimes used to generate data for PHAs. Evaluation of environmental contamination data typically proceeds simultaneously with the exposure pathway evaluation.

Exposure Investigations

When a PHA exposure evaluation concludes that additional exposure information is needed, an exposure investigation generally is conducted. An exposure investigation is the collection and analysis of study area-specific information to determine if human populations have been exposed to air toxics. This information may include environmental sampling, exposure-dose reconstruction, biologic or biomedical testing, and/or evaluation of medical information.

- **Characterize Exposure Pathways.** During the exposure pathway characterization, the assessor evaluates who may be or has been exposed to study area contaminants, for how long, and under what conditions. This involves identifying and studying the following five components of a “complete” exposure pathway: a source of air toxics; a mechanism for release into the air and, in some cases, transfer between media (i.e., the fate and transport of environmental contamination); an exposure point or area; an exposure route (e.g., ingestion, dermal contact, inhalation); and a potentially exposed population. The overall purpose of this evaluation is to understand how people might become exposed to study area contaminants and to identify and characterize the size and susceptibility of the potentially exposed populations. If no complete or potentially complete exposure pathways are identified, no public health hazards exist and there is no need to perform further scientific evaluation. When complete environmental or biologic data are lacking for a study area, an exposure investigation may be recommended to better assess possible impacts to public health.

30.5.5 Health Effects Evaluation

If the exposure evaluation shows that people have been or could be exposed to pollutants such as air toxics, the public health assessor will evaluate whether this contact could have resulted in harmful effects. Assessors use existing scientific information to determine the health effects that may result from exposures. Public health agencies recognize that children, because of their play activities and their growing bodies, may be particularly vulnerable to exposures to air toxics. Developing fetuses also may be more vulnerable to such exposures. Thus, the impact to children and developing fetuses is considered first when evaluating the health threat to a community. The health effects evaluation is composed of two basic substeps: a screening analysis and a more in-depth analysis.

- **Screening Analysis.** Screening is a first step in understanding whether the detected concentrations to which people may be exposed are harmful. The screening analysis is a fairly standard process developed to help health assessors sort through the large volumes of environmental data for a study area. It enables the assessor to safely rule out substances that are not at levels of health concern and to identify substances and pathways that need to be

examined more closely. For complete or potential exposure pathways identified in the exposure pathway evaluation, the screening analysis may involve comparing media concentrations at points of exposure to “screening” values (based on protective default exposure assumptions) and estimating exposure doses based on study area-specific exposure conditions. The assessor then compares estimated doses with health-based guidelines to identify substances requiring further evaluation. Exhibit 30-4 describes several of the ATSDR-derived comparison values available. See Chapter 12 for how these values are used in an air toxics risk assessment.

Exhibit 30-4. Definitions of ATSDR-Derived Comparison Values

Environmental Media Evaluation Guides (EMEGs). EMEGs are estimated contaminant concentrations that are not expected to result in adverse noncarcinogenic health effects based on ATSDR evaluation. EMEGs are based on ATSDR MRLs and conservative assumptions about exposure, such as intake rate, exposure frequency and duration, and body weight.

Minimal Risk Levels (MRLs). An MRL is an estimate of daily human exposure to a substance (in mg/kg/day for oral exposures and parts per million [ppm] for inhalation exposures) that is likely to be without noncarcinogenic health effects during a specified duration of exposure based on ATSDR evaluations.

Cancer Risk Evaluation Guides (CREGs). CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed during their lifetime (70 years). ATSDR’s CREGs are calculated from EPA’s cancer slope factors (CSFs) for oral exposures or unit risk values for inhalation exposures. These values are based on EPA evaluations and assumptions about hypothetical cancer risks at low levels of exposure.

Reference Media Evaluation Guides (RMEGs). ATSDR derives RMEGs from EPA’s oral reference doses, which are developed based on EPA evaluations. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects.

- **In-depth Analysis.** For those pathways and substances that were identified in the screening analysis as requiring more careful consideration, the assessor will examine a host of factors to help determine whether study area-specific exposures are expected to result in illness. In this in-depth analysis, exposures are studied in conjunction with substance-specific toxicologic, medical, and epidemiologic data. Through this analysis, the assessor will be answering the following question: Based on available exposure, toxicologic, epidemiologic, medical, and study area-specific **health outcome data**, are adverse health effects expected in the community?

Answering this last question can be very challenging. For example, evaluating epidemiological data involves addressing a number of criteria to assist in judging the causal significance of associations revealed in studies (epidemiology is described in more detail in Exhibit 30-5). Individual criteria, if met, support a causal relationship but do not prove it. The more criteria that are met, the more likely it is that an observed health effect is causally related to the exposure under study. The criteria for evaluating causation are:

- **Time sequence.** Exposure must precede the onset of the disease. A logical sequence of events must be demonstrated.

Exhibit 30-5. What Are Epidemiologic Data and How Might They Be Used in an In-Depth Analysis?

Epidemiologic data are one of the key distinguishing features of PHAs compared to most quantitative risk assessments. Understanding the strengths and weaknesses of the various types of epidemiologic studies will help determine the suitability of a particular study in supporting and drawing study area and substance-specific public health conclusions. Because of the inherent limitations and uncertainties associated with environmental epidemiologic evaluations (generally due to the lack of adequate exposure data or sample size), however, *epidemiologic data should be used with caution*. The health assessor should call upon an epidemiologist to assist in evaluating the applicability and usability of literature-based or study area-specific epidemiologic data. The types of epidemiologic data that may be available and how they may be used are briefly summarized below, in order of greatest potential utility:

- **Analytical studies**, such as case-control or cohort studies, evaluate the role of various risk factors in causing illness or disease by relying on comparisons between groups. Depending on the quality of the study, it may provide insight to the study area-specific exposure situation under evaluation. Study area-specific analytical studies that meet certain design criteria examine study area-specific exposures and health outcomes in community members. When available, these studies are the most relevant to the PHA. These data are rarely initially available, but the PHA process may lead to a recommendation to collect such data. Depending on the individual study design and health outcome studied, results may provide some insight on the presence or absence of a particular illness of concern in the community. Unfortunately, establishing a definitive link with a study area-related exposure is generally difficult if not impossible.
- **Descriptive (or ecological) studies** examine differences in disease rates among populations over time or in different geographical locations and may be helpful in identifying plausible associations between a particular substance and disease. However, descriptive studies provide limited information on causal relationships (i.e., the degree of exposure or causal agent).
- **Case reports** that describe an effect in an individual or small group can be considered in the in-depth analysis, but may have limited usefulness due to the generally small size of the affected population and sometimes anecdotal nature of the reports.

- **Strength of association.** The stronger the association, the more likely it is causal. The relative magnitude of the incidence of disease in those exposed compared to the incidence in those who are not exposed can be a valuable measure of the strength of the association.
- **Dose-response relationship.** The probability and/or severity of the effect should increase with increasing intensity and duration of exposure.
- **Specificity of association.** If the effect is unusual or is specific to the studied exposure, a causal relationship is more easily demonstrated.
- **Consistency.** A relationship should be reproducible (i.e., observed in other studies or analyses).

- **Biologic plausibility (or coherent explanation).** The link between the “cause” and the effect should make sense biologically, by what is known about the disease and the exposure under study. The findings should be validated by what is known about animal models.

Similarly, biologic sampling results (biomarkers) need to be interpreted with caution. Specifically, issues to consider include: (1) as with environmental sampling data, biologic data need to be collected by trained professionals and analyzed in a standard way; (2) detected levels may not be the result of study area-related exposures (e.g., blood lead levels resulting from non-air toxics sources such as flaking paint); (3) results will likely only represent a snapshot of conditions in time; (4) the association between detected levels and clinical effects may not be understood based on scientific knowledge; (5) “normal” ranges, particularly for trace elements, may not be known; and (6) the people tested may not be fully representative of the exposed population, resulting from a small sample size and variations in exposures across the exposed population due to different activity patterns.

30.5.6 Draw Public Health Conclusions

Upon completing the exposure and health effects evaluations, the assessor will draw conclusions regarding the degree of hazard posed by a study area - that is, they will conclude either that the study area does not pose a public health hazard, that the study area does pose a public health hazard, or that insufficient data are available to determine whether any public health hazards exist. The process also involves assigning a **hazard conclusion category** for the study area or for an individual exposure pathway (Exhibit 30-6).

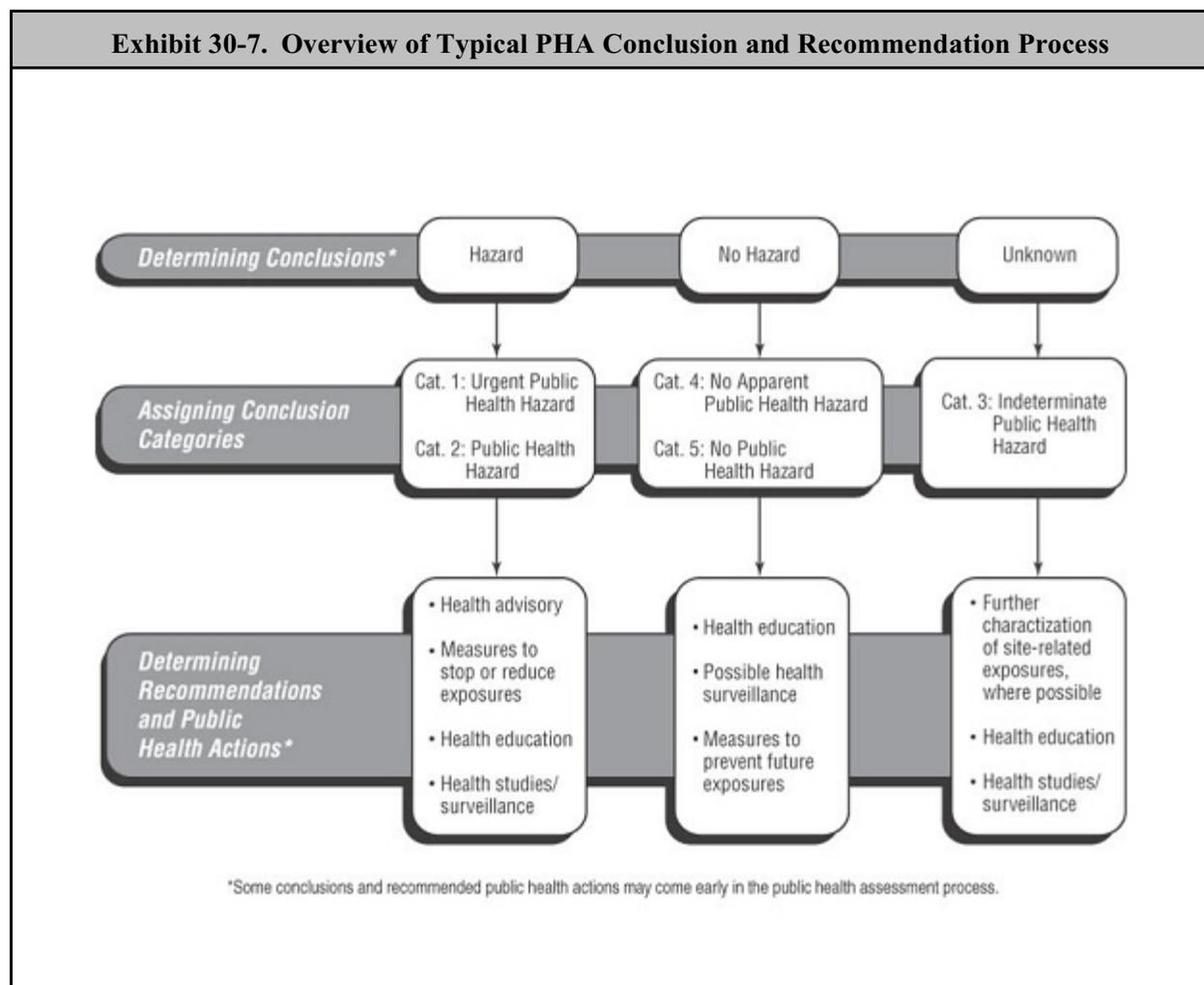
Exhibit 30-6. Summary of ATSDR Conclusion Categories	
Category	Definition
1. Urgent Public Health Hazard	Applies to study areas that have certain physical hazards or evidence of short-term (less than 1 year), study area-related <i>exposure to hazardous substances that could result in adverse health effects and require quick intervention to stop people from being exposed.</i>
2. Public Health Hazard	Applies to study areas that have certain physical hazards or evidence of chronic, study area-related <i>exposure to hazardous substances that could result in adverse health effects.</i>
3. Indeterminate Public Health Hazard	Applies to study areas <i>where critical information is lacking</i> (missing or has not yet been gathered) to support a judgment regarding the level of public health hazard.
4. No Apparent Public Health Hazard	Applies to study areas where exposure to study area-related chemicals might have occurred in the past or is still occurring, but the <i>exposures are not at levels expected to cause adverse health effects.</i>
5. No Public Health Hazard	Applies to study areas where <i>no exposure</i> to study area-related hazardous substances exists.

30.5.7 Recommend Public Health Actions

After drawing conclusions, the public health assessor – usually in cooperation with other team members and stakeholders – will develop recommendations for actions, if any, to prevent harmful exposures, obtain more information, or conduct other public health actions. These actions generally will be detailed in a public health action plan, which will ultimately be part of the PHA document (or possibly the public health consultation document) developed for the study area. Note that some public health actions may be recommended earlier in the process. See Exhibit 30-7 for an overview of the conclusions and recommendations process.

30.5.8 Prepare PHA Documents

The public health assessor may develop various materials during the PHA process to communicate information about the assessment, including outreach materials, health advisories that alert the public and appropriate officials to the existence of an imminent public health threat, and, at the end of the assessment process, a report that summarizes the approach, results, conclusions, and recommendations. This report generally is either a **public health assessment** (PHA) document or a **public health consultation** (PHC).



References

1. Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Public Health Assessment Guidance Manual (Update): Draft for Public Comment.. Available at: <http://www.atsdr.cdc.gov/HAC/PHAManual/cover.html>.