

**A New Strategic Direction:  
A Plan to Implement  
Environmental  
Public Health Tracking  
in Connecticut**



**A Report of the  
Connecticut Environmental Public Health  
Tracking Consortium**

**May, 2005**

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## Connecticut EPHTP Consortium

We gratefully acknowledge the members of the Environmental Public Health Tracking Consortium for their time and efforts spent developing this report as well as the following individuals for their review and contributions:

Carmine DiBattista, MS

Retired, Chief of Air Management Bureau, CT Department of Environmental Protection  
EPHTPC Chairman

Gary Archambault, MS  
CT Dept. of Public Health

Charles McKay, MD  
CT Poison Control Center

Yvonne Bolton, MSL, JD  
CT Dept. of Environmental Protection

Eileen Storey, MD, MPH  
Div. of Occupational Environmental Medicine  
University of Connecticut

Steve Fish, MS  
CT Dept. of Environmental Protection

Brian Toal, MSPH  
CT Dept. of Public Health

*The invited members of the EPHTC are experts representing a diverse group of individuals from the health, environmental, business and community sectors.*

Candace Bartholomew  
UCONN Coop. Ext. System

Adam Borgida, MD  
St. Francis Hospital  
Dept. of Obstetrics and Gynecology

David Brown, ScD  
Public Health Toxicologist  
NESCAUM

Cheryl Ann Carotenuti, RN, MSN  
CT Dept of Education

Ellen Cromley, PhD  
University of Connecticut  
Geography Dept.

David Gregorio, PhD  
UCONN Health Center  
Dept of Community Medicine

Charles Huntington, PA, MPH  
CT Area Health Education  
Centers

Cynthia R, Jennings, Esq  
Environmental Justice  
The Barrister Law Group, LLC

Margaret LaCroix, MPA  
American Lung Association

Richard Matheny MPH, MFS, RS  
Farmington Valley Health  
District

Gary Perlman, MPH, RS  
ATSDR Region 1 Office

Kenneth Price, MPH, CHP  
UCONN Health Center  
Radiation Safety

Paul Schur, MPH  
Retired, DPH

Adam Seidner, MD, MPH  
Travelers Property Casualty

Hilary Silver, MPP  
Department of Social Services

Archie Swindell, PhD  
Statistical Consultant

Carolyn Wysocki, MA, MHSA  
Ecological Health Organization, Inc

## **EPHTPC Assessment Committee**

### **Dr. Eileen Storey, Committee Chair**

Diane Aye CT DPH, BRFS	Steve Fish CT DEP	Adam Seidner Travelers Property Casualty
Candace Bartholomew UCONN Cooperative Ext.	Katherine Kelley CT Public Health Laboratory	Archie Swindell Statistical Consultant
David Brown Public Health Toxicologist NESCAUM	Charles McKay CT Poison Control Center	Carolyn Jean Webb CT Public Health Laboratory
Cheryl Carotenuti CT Dept. of Education	Paula Schenck UCONN Health Center Div. Occ. and Env. Medicine	Carolyn Wysocki Ecological Health Organization, Inc.
Carmine DiBattista EPHTPC Chairman	Paul Schur Assistant Clinical Professor	

## **EPHTPC Database Committee**

### **Dr. Charles McKay, Committee Chair**

Gary Archambault CT DPH - EPHTP	Steve Fish CT DEP	Adam Seidner Travelers Property Casualty
Yvonne Bolton CT DEP	Karen Frost CT DPH - EPHTP	Hilary Silver Dept. of Social Services
Thomas Botti CT DEP	Charles Huntington CT AHEC	Archie Swindell Statistical Consultant
David Brown NESCAUM	Al Leston NESCAUM Consultant	Dana Tomlin Yale University
Ellen Cromley University of Connecticut Dept. of Geology	Patricia Miskell CT DPH - Asthma Program	Carolyn Jean Webb CT DPH Laboratory
Carmine DiBattista EPHTPC Chairman	Kenneth Price UCONN Health Center Radiation Safety	Carolyn Wysocki Ecological Health Organization, Inc.
Justin Duran CT DEP	Paula Schenck UCONN Health Center Div. Occ. and Env. Medicine	

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Margaret Round, formerly of NESCAUM  
Mary Lou Fleissner, CT DPH, Tumor Registry  
Bernard Sangalli, CT Poison Control Program  
Kaila Riggott, Office of Health Care Access  
Mary Lyon, CT Hospital Association  
David Brown, NESCAUM

### *CT Dept. of Public Health Staff*

Federico Amadeo  
Eileen Boulay  
Marcia Cavacas  
Joan Foland  
Margaret Hynes  
Chun-fu Liu  
Lloyd Mueller  
Justin Peng  
Cathryn Phillips  
Ratan Singh  
Thomas St. Louis  
Robin Tousey-Ayers  
Conrad Wopperer

### *CT Dept. of Environmental Protection Staff*

Steve Bailey  
Mike Beauchene  
Peter Brunelli  
Ron Freeto  
Denny Galloway  
Thom Haze  
Keith Hill  
Kurt Kebshull  
Matt Lyman  
David Madsen  
Reid Matuske  
Kevin O'Brien  
Ellen Pierce  
Andrew Pollack  
Brad Robinson  
Peggy Sargis  
Randall Semagin  
Bill Simpson  
Carol Smith  
Howard Sternberg  
Dean Tully  
George Wisker  
Victor Yanosy  
Peter Zack

**EPHTP Staff**

Gary Archambault, MS, CT DPH  
Karen Frost, MA, CT DPH  
Justin Duran, CT DEP

**Consultants to EPHTP**

***duBay Horton Associates, LLC***

Kristin duBay Horton, MPH  
Melissa Hernandez  
Connie Heye, MPH  
Ronni Humes  
Kate Lawder, MA, MPH  
Melissa McGarry  
Michelle Stafford Wirth

***University of Connecticut Staff***

Paula Schenck, MPH  
Nancy Simcox, MS

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## **A Message from the Chair of the CT Environmental Public Health Tracking Consortium, Carmine DiBattista**

This initiative began with the findings of the September 2000, Pew Environmental Health Commission report and subsequent actions of the Centers for Disease Control and Prevention identifying a nationwide need for better tracking of potential environmental hazards and public health concerns. Backed by their successful records, the Department of Public Health and the Department of Environmental Protection accepted the challenge. The Environmental Public Health Tracking Consortium was formed to advise and assist these lead agencies. It was recognized that the Consortium's assignment might be a unique one-time opportunity. Therefore, the dismantling of historic communication barriers became a priority. This effort included the employment of unprecedented outreach which touched many different sectors and individuals within Connecticut. This communication process is worthy of continuation and review for similar future endeavors.

The thoughtfulness of this report clearly demonstrates the value of bringing together a group of expert and diverse individuals committed to improving the quality of life in Connecticut. Available to Connecticut is a new strategic direction for the identification of linkages and associations between public health and environmental hazard conditions. It is expected that the Centers for Disease Control and Prevention will adopt portions for national application. Tracking to identify linkages and associations between public health and environmental hazards is already taking place in Connecticut. However, some reinvention will be required for the development of innovative ways of data capture, analysis and reporting. Current designs in different federal and State agencies and in other public and private settings do not always serve common objectives. This situation is often caused by different legislative mandates, separate funding sources and non-integrated agendas. This circumstance has been caused, in large part, by the rapid evolution of highly complex societal challenges and needs.

The most effective health based interventions will rely on information that is readily available and user friendly. Further, desired outcomes will be highly dependent on administrative, legislative and management commitments at the highest levels of federal and State government. Such a commitment must include other public and private entities. A broad base of capacity building will result in desired outcomes sooner.

Success will be dependent upon how State authorities approach implementation. The recommendations should not be treated as separate projects. Rather, they should be viewed and treated as an integral and interdependent network of actions, many of which require the institutionalization of new and innovative ways of supporting and conducting risk assessment and management. For example, even though the Consortium has made separate recommendations for cardiovascular disease and asthma, there is evidence that airborne concentrations of particulate matter are associated and linked with both cardiovascular disease and asthma. In this case, as in others, a multidimensional approach would be warranted.

A cultural change within State agencies and between different State agencies, and by other public and private entities will be needed at varying degrees. With such changes and commitment, consistency in decision making should be improved leading to public quality-of-life benefits. In the past our society has not always responded in a timely manner to linkages and associations between diseases and environmental hazards. Looking into the future, this new strategic direction is designed to promote a basis for recognizing more quickly linkages and associations between public health and environmental hazards while employing the use of common sense and fairness. Optimally, prevention would be the over-riding goal, taking into account disproportionate risks among certain populations.

The Connecticut Departments of Public Health and Environmental Protection are to be commended for creating a Consortium of individuals with diverse and noteworthy expertise, and unquestionable commitment to inter-agency cooperation and improvement of the health of Connecticut citizens. Connecticut's legislative and regulatory histories are rich with a demonstrated willingness to act promptly in the face of some uncertainty by creating the basis for interventions that promotes improved quality of life. It is to this end that the success of the Consortium's recommended strategic direction will be measured.



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## Abbreviations Used In This Plan

AHEC	Area Health Education Center
AIRS	Aerometric Information Retrieval System
AMI	Acute myocardial infarction
AQS	Air Quality System
ATSDR	Agency for Toxic Substances and Disease Registry
BC	Black carbon
BMI	Body mass index
BRFSS	Behavioral Risk Factor Surveillance Survey
CADIS	Compliance Analysis Database and Information System
Cal/EPA	California Environmental Protection Agency
CBIA	Connecticut Business and Industry Association
CCAG	CT Citizens Action Group
CDC	Centers for Disease Control and Prevention
CDHS	California Department of Health Services
CEDSS	CT Electronic Disease Surveillance System
CEPHTP	CT Environmental Public Health Tracking Program
CFIDS	Chronic Fatigue Immune Dysfunction Syndrome
CHIME	CT Hospital Association's healthcare information system
CLPPP	Childhood Lead Poisoning Prevention Program
CO	Carbon monoxide
COPD	Chronic Obstructive Pulmonary Disease
CPCC	CT Poison Control Center
CT CEQ	CT Council on Environmental Quality
CT DEP	Connecticut Department of Environmental Protection
CT DPH	Connecticut Department of Public Health
CT DPHL	Connecticut Department of Public Health Laboratory
CT EPHTP	CT Environmental Public Health Tracking Program
CT HIP-Kids	Health Information Profile for Connecticut Children
CTHANES	CT Health and Nutrition Examination Survey
CTLCV	CT League of Conservation Voters
CT OPM	CT Office of Policy and Management
CYSHCN	Children and Youth with Special Health Needs
DDT	Dichlorodiphenyltrichloroethane
DEP ECO	DEP Environmental Conditions Online
DHA	duBay Horton Associates LLC
DRG	Diagnosis related group
ED	Emergency Department
EDGE	Environmental Data and Geographic Exchange (Initiative)
EHHI	Environment and Human Health Institute
EPA	Environmental Protection Agency
EPHTN	Environmental Public Health Tracking Network
EPHTPC	Environmental Public Health Tracking Planning Consortium
ERC	Emergency Response Coordinator
ESC E-DAS	Environmental Data Acquisition Systems
ETS	Environmental tobacco smoke

FEAT	Families for Effective Treatment of Autism
FM	Fibromyalgia Syndrome
GIS	Geographic Information System
GPS	Global Positioning System
HAR	Health Assessment Record
HIC/IRB	Human Investigations Committee/Internal Review Board
HIPAA	Health Insurance Portability and Accountability Act
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
HUSKY A	Healthcare for Uninsured Kids and Youth (Medicaid plan)
IARC	International Agency for Research on Cancer
IOM	Institute of Medicine
KII	Key informant interviews
LHD	Local Health Departments
LISWQMP	Long Island Sound Water Quality Management Program
MCS	Multiple Chemical Sensitivities
MTBE	Methyl tert-butyl-ether
NATTS	National Air Toxic Trends Study
NCI	National Cancer Institute
NEI	National Emission Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NIEHS	National Institute of Environmental Health Sciences
NO <sub>x</sub>	Nitrogen oxides
OHCA	Office of Health Care Access
OMS	Ozone Mapping System
PACE	People's Action for Clean Water
PAH	Polycyclic aromatic hydrocarbons
PAMS	Photochemical Assessment Monitoring Sites
Pb	Lead
PBB	Polybrominated biphenyls
PBDE	Polybrominated diphenyl ether
PCB	Polychlorinated biphenyls
PM	Particulate matter
SAROAD	Storage and Retrieval of Aerometric Data
SEER	Surveillance and Epidemiology End Results (National Cancer Institute)
SGA	Small for gestational age
SITS	Spill Incident Tracking System
SO <sub>x</sub>	Sulfur oxides
SQUID	Sediment Quality Information Database
TCDD	(2,3,7,8-TCDD) Dioxin
TEQ	Toxic equivalent
VOC	Volatile organic compound
WTC	World Trade Center

## **Executive Summary**

In September 2000, The Pew Environmental Health Commission released a report entitled “*America’s Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network*” which highlighted the need to critically monitor the linkage between environmental exposure and chronic disease and other adverse health outcomes in the United States. This report led to the Centers for Disease Control and Prevention (CDC) funding of states to plan for and develop Environmental Public Health Tracking efforts in the United States.

The Connecticut Department of Public Health (CT DPH), in collaboration with the CT Department of Environmental Protection (CT DEP), received funding for the development of CT’s portion of a National Environmental Public Health Tracking Network (EPHTN) through a planning grant in federal fiscal year 2002. One of the goals of the grant was to establish a planning consortium of technical experts and other key stakeholders to provide recommendations for planning and implementing a tracking network in CT. This Environmental Public Health Tracking Planning Consortium (EPHTPC) has been a grassroots effort to engage a broad and diverse group of experts in the fields of public health and the environment. This group has engaged in an open, deliberative, thoughtful process to develop plans for an environmental public health tracking system which would both respond to national priorities and reflect the needs and concerns specific to Connecticut. This group has sought to address the traditional separation between professionals in public health and the environment by considering common concerns, the language to frame these concerns, and methods to understand and prioritize them. The Consortium’s work began in the spring of 2002 with the invitation of experts in public health and the environment and the hiring of a contractor to facilitate the planning process.

The Consortium as a whole has met seven times over twenty months to review the work of its two committees and to deliberate and develop recommendations for the implementation of environmental public health tracking in Connecticut. Its two committees, Assessment and Database, worked separately to understand the concerns of Connecticut residents as well as health and environmental professionals. The committees also worked with concerned community groups and reviewed the available datasets to study these concerns. Simultaneously, a literature review was conducted to ensure that state of the art science guided the development of an environmental public health tracking system for the state.

This plan summarizes the work of the EPHTPC and its committees and proposes plans for Connecticut to implement the goals of the CDC and the Pew Commission for the state of Connecticut. The principles and recommendations are the core of this plan. The recommendations are complex, and come with an understanding of the limited resources available to undertake these efforts. The Consortium membership urges all those interested in this effort to secure the resources necessary to take this effort on fully – and to begin with efforts which can be undertaken now given limited resources. If implemented as set forth in these recommendations, environmental public health tracking in Connecticut could serve as a model for other states. It would also serve to educate both experts in the fields of public health and the environment and members of the public, and would promote better understanding of diseases and environmental hazards affecting Connecticut residents. Finally, successful implementation of the recommendations will allow CT to direct limited resources to the tasks most likely to result in long-term environmental and health benefits for CT citizens.

***Recommendations:***

- |                  |   |
|------------------|---|
| Recommendation 1 | Continue the commitment to environmental public health tracking by: A) Convening a new Consortium to inform and advise the CT DEP and CT DPH on Environmental Public Health Tracking and to assist in the implementation of the following recommendations; B) Pursuing additional funding to implement recommendations; and C) Assigning appropriate resources to accomplish all tasks. |
| Recommendation 2 | Develop coordinated systems to systematically track chronic diseases and other adverse health outcomes and develop coordinated systems to systematically track environmental exposures.   |
| Recommendation 3 | Seek to explore: A) Emerging risks and links identified by public health and environmental science and B) concerns brought forward by the public.   |
| Recommendation 4 | Develop an equivalent to the National Health and Nutrition Examination Survey (NHANES) in Connecticut, with affiliated biomonitoring, to allow tracking of both non-infectious diseases and exposure to environmental agents.   |
| Recommendation 5 | Identify past, present, and future land use and development patterns use as an integral data and information base for the environmental public health tracking initiative.  |

Recommendation 6	Initiate EPHT efforts in Connecticut through the development / enhancement of data systems and trial linkages for the following initial areas of prioritized health and environmental topics:
<i>Asthma</i>	Improve data collection systems to collect and evaluate data regarding asthma and potentially related environmental factors.
<i>Lead</i>	Evaluate potential linkage between blood lead levels and learning disabilities as a trial link between an environmental toxin and a chronic neurological disease.
<i>Cardiovascular</i>	Explore the links between cardiovascular disease and air pollution.
<i>Cancer</i>	Develop an infrastructure that will facilitate investigations of possible environmental influences on cancer rates.
<i>Pesticides</i>	Develop a pesticide use and accidental exposure database.
<i>Water</i>	Expand evaluation and monitoring of data of Connecticut's water supplies.



## Chapter One: Environmental Public Health Tracking Consortium Process

*The invited members of the EPHTP Consortium are experts representing a diverse group of individuals from the health, environmental, business and community sectors. The consortium process was iterative with an initial meeting of potentially interested participants from several sectors. Participants identified their environmental and health concerns and personal impressions of the need for tracking. The work of the Consortium was largely accomplished through two committees: assessment and database. The Consortium reviewed the work of the committees, provided guidance, and developed recommendations.*

The release of the Pew Report in September 2000 precipitated the first CDC awarded Public Health Tracking grant to the state of California. The California Department of Health Services, (CDHS) in cooperation with the California Environmental Protection Agency (Cal/EPA) and the University of California brought together a group of diverse stakeholders that represented a range

of expertise regarding environmental health issues. They defined Public Health Tracking as follows:

Environmental Health Tracking is the ongoing systematic collection, integration, analysis, interpretation, and dissemination of data about environmental hazards, exposure to environmental hazards, and health effects potentially related to exposure to environmental hazards. Approximately 7 out of every 10 deaths in the United States are due to chronic diseases and there is growing scientific evidence that environmental factors (such as pesticides and toxic air pollutants) are strongly linked to many chronic diseases (such as asthma, birth defects, and cancers). Exposure to environmental hazards accounts for a significant proportion of many chronic diseases, including an estimated 30% of childhood asthma exacerbations and 10% of neurodevelopmental disorders in children.<sup>1</sup>

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<sup>1</sup> America's Environmental Health Gap; "Why the Country Needs a Nation-wide Health Tracking Network", Companion Report. Sponsored by the PEW Environmental Health Commission, Environmental Health Tracking Project Team, Johns Hopkins School of Hygiene and Public Health. Department of Health Policy and Management. September 2000

The Connecticut Department of Public Health (DPH), in collaboration with the Connecticut Department of Environmental Protection (DEP), received funding for an Environmental Public Health Tracking Network (EPHTN) planning grant in federal fiscal year 2002. One of the goals of the grant was to establish a planning consortium of technical experts and other key stakeholders to provide recommendations for planning and implementing the tracking network.

In Connecticut, the Environmental Public Health Tracking Planning Consortium (EPHTPC) has been a grassroots effort to engage a broad and diverse group of experts in the fields of public health and the environment. This group has engaged in an open, deliberative, thoughtful process to develop plans for an environmental public health tracking system which would both respond to national priorities and reflect the needs and concerns unique to Connecticut. This group has sought to broaden the perspectives between professionals in public health and the environment to a more holistic outlook that examines relationships outside of those traditionally confined to one discipline or another. The process has involved the consideration of common concerns, the language to frame these concerns, and methods to understand and prioritize them. The Consortium's work began in the spring of 2002 with the invitation of experts in public health and the environment and the hiring of a contractor, duBay Horton Associates (dHA) to facilitate the planning process.

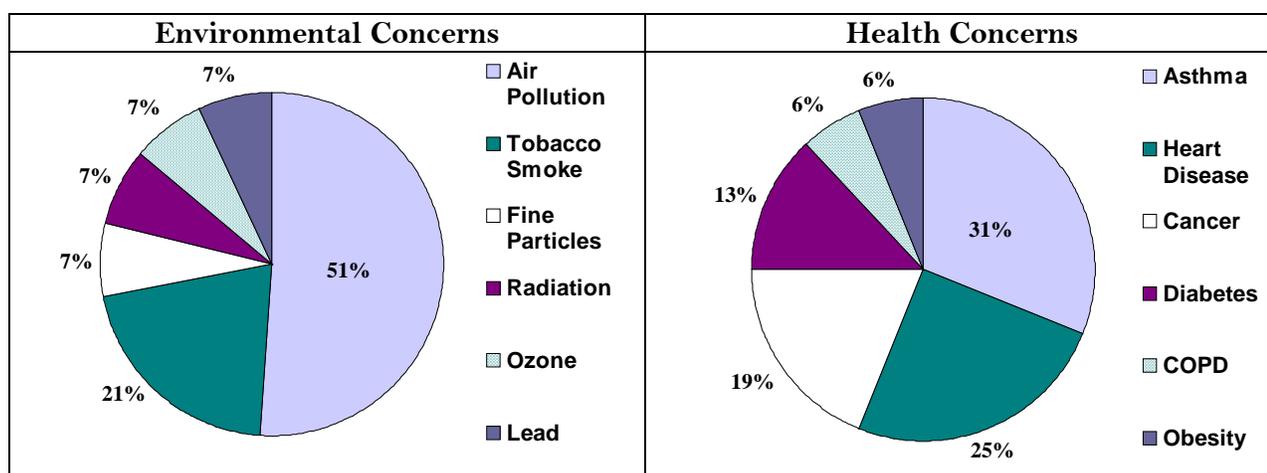
The CT DPH and DEP developed a list of experts in a wide variety of fields to comprise the Consortium for the environmental public health tracking planning effort. The first Consortium meeting was held on May 16<sup>th</sup>, 2003 and the primary purpose was to orient Consortium members to the planning process, to provide a structure for the process, and to solicit ideas for additional committee participants. The Consortium membership elected Mr. Carmine DiBattista to be Consortium chair.

Two committees were formed at this meeting: Assessment and Database. The Assessment Committee was responsible for assessing the major environmental and public health concerns of Connecticut. The Database Committee was charged with inventorying available databases and evaluating the potential data linkages of environmental factors and human health outcomes. Drs. Eileen Storey and Charles McKay, consultants to the DPH from the University of Connecticut, agreed to chair the Assessment and Database committees, respectively. The three chairs and staff of the CT DEP and CT DPH formed the Leadership Committee of the Consortium. The Leadership Committee met between Consortium meetings to plan, discuss and oversee the process. By the second Consortium meeting in September 2003, the work of the Committees was well underway –

and the group developed a timeline for the environmental public health tracking planning effort. Consortium and committee mission statements (Appendix 1) and timelines (Appendix 2) were reviewed and Consortium members were asked to make recommendations for additional Committee participants.

While the Consortium agreed to engage in a deliberative process to develop priorities for program development, they did participate in a straw poll at the first meeting to identify primary health and environmental concerns as they perceived them. The results are shown below in Figure 1:

**Figure 1: EPHT Consortium Straw Poll Results (N = 18)**



Consortium meetings over the next two years were enhanced by:

- Detailed pre-meeting packages with information to re-orient and prepare participants prior to the meetings.
- Meetings focused on decision-making and action steps rather than information gathering.
- Regular meeting locations for ease of transport and attendance.
- Website with calendar, meeting minutes, pre-meeting packages, available to Consortium members.
- Simplified formal meeting evaluation and ongoing informal conversations with Consortium members to gauge satisfaction with efforts.

In year two, the Consortium focused its efforts on committee work – establishing and focusing on the Database and Assessment Committee efforts. The Assessment Committee undertook significant outreach to public health, medical, business & industry, environmental and community groups. It collected information through a survey of local health directors, by adding questions to the BRFS survey, by reviewing of available documents and websites supported by stakeholders in Connecticut, and by conducting a series of focus groups. The Database Committee assisted lead agencies in the

development of a process/tool for CT DEP/DPH staff to utilize in inventorying databases. With this tool, the EPHTP staff completed a review of a number of health and environmental databases.

The first two Consortium meetings in year two of the planning efforts (held in March and June 2004) focused on the results of the assessment efforts (See Chapter Two for full description of findings). NESCAUM (Northeast States for Coordinated Air Use Management) also presented their evaluation of air pollution databases in Connecticut for use in environmental public health tracking.

At the next Consortium meeting (September 2004), the Database Committee presented the results of their resource inventory work and the process for development of the literature review was discussed. In October 2004, the Consortium reviewed recommendations drafted by the Consortium leadership and provided feedback. Consortium members, committee members, and DEP/DPH staff were asked to give additional feedback outside of the meeting by working in small groups on specific recommendations.

Consortium members reviewed the first draft of this plan in October 2004. In January 2005, the Plan was again reviewed by EPHTPC leadership and Consortium members who provided comment and input. The final plan was given to the Commissioners of Public Health and Environmental Protection in May 2005. For a more detailed accounting of specific meetings, please see Appendix 3, Consortium and Committee Meetings by Date and Topic.

## Chapter Two: EPHTPC Assessment Committee Findings

*The Assessment Committee identified concerns of professionals and community members to guide the development of systems to track chronic disease and environmental exposures. The concerns are remarkably convergent among a wide set of stakeholders. All segments of the community expressed a need for better systems to track health status and environmental risks.*

The (CTEPHTP) Assessment Committee sought to understand and document the health and environmental concerns of CT residents. Please see Appendix 1 for the Assessment Committee Mission Statement and Goals.

The results of this assessment have been instrumental in setting priorities for an Environmental Public Health Tracking System. Given limited time and resources for this effort,

the Committee utilized a combination of secondary and primary data collection efforts that could be analyzed to profile priority health and environmental concerns of CT stakeholders. Primary data collection efforts included the participation in the development of the State Laboratory's Biomonitoring Survey, the addition of questions to the State's Behavioral Risk Factor Surveillance Survey (BRFSS) random digit dial survey, and the gathering of information through multidisciplinary professional and community focus groups and key informant interviews. In addition, secondary data sources, which offered insight into the health and environmental concerns of CT residents, were also reviewed. Brief results of specific activities of the Assessment Committee follow, including the Biomonitoring Survey, BRFSS, Secondary Data Review, and Focus Groups and Key Informant Interviews. Appendices 4, 5, 6, 7, 8 and 9 provide additional detail on phases and results of Assessment Committee efforts.

## **Survey of Local Health Directors and Environmental Groups**

The Connecticut Department of Public Health Laboratory (DPHL) was awarded funding in 2001 through the National Center for Environmental Health at CDC to formulate a plan to develop capacity and capability to monitor for environmental chemicals in human body tissue (biomonitoring). Members of the Environmental Public Health Tracking Consortium have worked closely with the biomonitoring project management and staff at various points, especially in the initial phases of the biomonitoring project. One of the first efforts of the biomonitoring project was a needs assessment survey. Key leaders in the EPHTPC effort were involved in the design of the survey – ensuring that the results could be used in the EPHTPC process.

### Methods:

The CT DPH Laboratory (DPHL) engaged in several different activities to assess the needs for biomonitoring in Connecticut. They included the formation of an advisory committee, as well as formal consultation through needs assessment surveys. The Biomonitoring Grant Survey had two major components: a survey of Local Health Directors and a Survey of Community Groups/Environmental Groups.

*Survey of Local Health Directors* – In the State of CT, 169 local municipalities are structured into 98 Local Health Departments (LHDs): 46 are full-time (28 municipal LHDs and 18 health districts of up to 18 towns) and 52 are part-time. The CT DPH also coordinates with two health districts associated with Tribal Nations. The LHDs are principally responsible for addressing local public health issues, and function as the primary responders to environmental health concerns or potential disease clusters in their communities. The CT DPHL conducted a survey of all LHDs in the state seeking their assistance in ascertaining: (1) analytes of concern or with which they work; (2) health conditions of concern or with which they work, (3) identified populations that may be exposed to environmental contaminants, (4) databases potentially useful for biomonitoring, and (5) willingness to participate with CT DPHL on future projects.

*Survey of Community Groups, Environmental Groups, and Voluntary Health Organizations* – CT DPHL also solicited input by means of a similar Needs Assessment Survey which was intended for approximately 120 community groups, environmental groups, voluntary health organizations, or individuals on an environmental justice mailing list in the state.

Results:

Fifty-seven LHDs, including 44 full-time departments/ districts/ Tribal Nations and 13 part-time departments, provided input. Their constituencies (118 municipalities total) represent a population of 2.95 million residents, or 86.5% of the CT's census year 2000 population. Responses were received from 14 of the organizations surveyed (11.7%). The surveys conducted with the biomonitoring project highlighted that LHDs had major concerns about indoor air quality (86%) and environmental tobacco smoke (61%). Approximately half of the LHDs identified naturally occurring radionuclides (radon), volatile organic compounds, asbestos, lead, pesticides, methyl-tert-butyl-ether (MTBE), and mercury as concerns. Environmental groups listed diesel emissions (50%), indoor air quality (43%), organochlorines (43%), volatile organic compounds (43%) and polycyclic aromatic hydrocarbons (PAH) (43%) as major concerns. When asked about health concerns, LHDs listed asthma (60%), followed by cancer, endocrine disorders such as diabetes, and learning and behavioral disorders. The community and environmental groups listed cancers, respiratory disease, endocrine disorders, and developmental problems as the health problems of greatest concern to their constituents. The list of prioritized environmental and health concerns of both groups can be found below in Table 1:

**Table 1: Prioritized List of Concerns from Biomonitoring Survey**

<b><i>LHD Environmental Concerns:</i></b>	<b><i>LHD Health Concerns:</i></b>	<b><i>Community Groups Environmental Concerns:</i></b>	<b><i>Community Groups Health Concerns:</i></b>
Indoor Air Quality Environmental Tobacco Smoke Naturally Occurring Radionuclides Volatile Organic Compounds (VOC) Asbestos Lead Pesticides MTBE Mercury	Asthma Cancer Endocrine Disorders (diabetes and learning and behavioral disorders)	Diesel Emissions Indoor air quality Organochlorides Volatile Organic Compounds (VOC) Polycyclic Aromatic Hydrocarbons (PAH)	Cancers Respiratory Disease Endocrine disorders Developmental Problems

Limitations:

There are recognized limits to this survey including:

- Local Health Directors may have a tendency to focus on the established programs and may not have the time or inclination to think about other issues.
- In the case of the environmental groups, the mailing list was based on an out-dated database, which may account for the low response rate.
- As in all survey work, there may be some selection bias in those who chose to respond to this sort of survey.

## Behavioral Risk Factor Surveillance Survey (BRFSS)

The Behavioral Risk Factor Surveillance Survey (BRFSS) is a CDC random digit dial survey performed on a state-by-state basis. The BRFSS is designed to question randomly selected people 18 and older about health and behavioral issues. To perform the BRFSS, states purchase a list of randomly generated phone numbers from which known business and non-working numbers have been eliminated. A contracted survey firm dials these numbers to determine the eligibility of the household (at least one adult 18 or older). Topics covered include:

- *Demographics* – age, sex, ethnicity, race, marital status, education level, employment status, income, county of residence, pregnancy status, children <18 in household
- *General health measures* – self-reported health status, health insurance, personal health care provider, quality of life and care giving, height, weight
- *Health conditions* – diabetes, awareness of high blood pressure, awareness of high cholesterol, oral health, asthma, cardiovascular disease, arthritis
- *Risk behaviors* – smoking, alcohol use, physical inactivity, injury related risk behaviors, sexual behavior, diet, excess weight
- *Health services* – breast cancer screening, cervical cancer screening, prostate cancer screening, colorectal cancer screening, flu and pneumococcal vaccine

The data from the BRFSS is sent to the CDC monthly. The CDC cleans and weights the data in order to compensate for unequal selection probability and to ensure that the data can be used to develop population estimates (in Connecticut, this adjustment is by age and gender). States receive the data, which includes some data analysis and tables, as annual results from the CDC any time between March and September of the following year. The data generated from BRFSS is used by universities, research organizations, health professionals in non-profit organizations, insurance companies, and managed care organizations for the tracking of health risk trends, program development, policy development, and program evaluations. In addition to the standard set of core questions, there are modules with additional questions if the individual respondent is willing to continue. There is also the possibility for individual States to contribute specific questions, and the Assessment Committee was able to take advantage of this opportunity.

### Methods:

The committee developed two questions which were administered through BRFSS to Connecticut residents in 2004. (Table 2) These assessed concerns related to seven environmental and seven health issues.

**Table 2: Assessment Committee added BRFSS Questions***“How concerned are you that the following things are likely to cause harm to you or your family?”*

Drinking Water	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Outdoor Air Pollution	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Indoor Air Quality	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Contaminants in food	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Environmental tobacco smoke	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Pesticides	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Mold	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref

*“How likely do you think the environment helps to cause the following health conditions?”*

Asthma	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Birth Defects	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Cancer	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Heart Disease	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Learning Disabilities	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Multiple Sclerosis	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Diabetes	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref
Arthritis	Most Likely	Somewhat Likely	Not Likely	Don't Know	Ref

The 2004 BRFSS also had two questions in its core which were of interest to the Assessment Committee. These questions ask about things in the air you breathe that may make you ill, not about an illness you can catch from other people, such as a cold.

5.1.1. *Things like dust, mold, smoke, and chemicals inside the home or office can cause poor indoor air quality. In the past 12 months have you had an illness or symptom that you think was caused by something in the air inside a home, office, or other building?*

5.2. *Things like smog, automobile exhaust, and chemicals can cause outdoor air pollution. In the past 12 months have you had an illness or symptom that you think was caused by pollution in the air outdoors?*

The 2003 BRFSS data primarily provides prevalence (some incidence) estimates and there are also questions about disease management in the various Modules (which are smaller, additional units of questions at the end of the Core questions). There are data on three areas of interest to the Consortium: Diabetes, Asthma, and, in one of the modules, Cardiovascular Diseases. The table below indicates which Health or Environmental concerns of interest to the EPHTPC were targeted by BRFSS in 2003 and which were targeted in 2004. Some are not addressed by BRFSS but are included in the figure to indicate that they were initially of concern to the Assessment Committee

**Table 3: BRFSS TOPICS OF INTEREST TO CT EPHTPC**

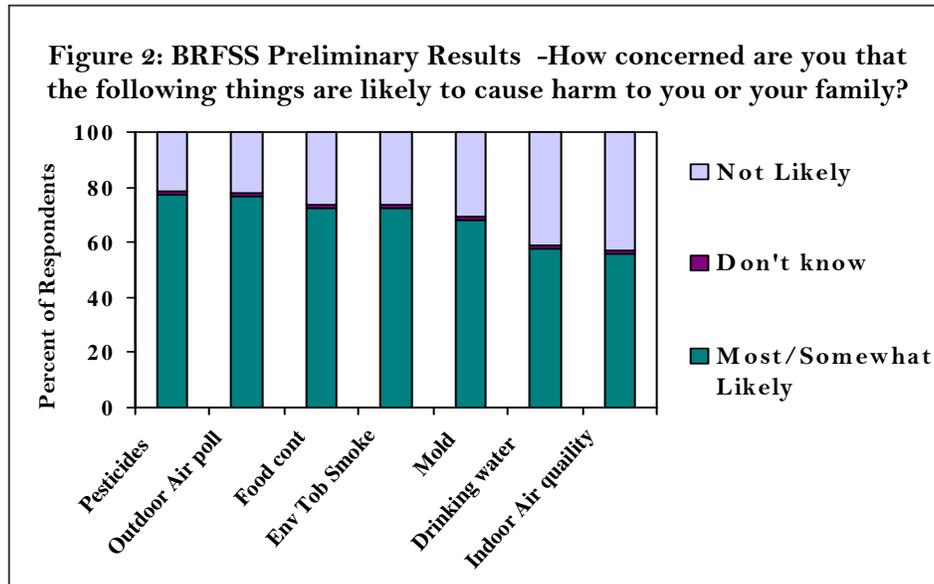
	<b>2003 CORE</b>	<b>2003 Modules</b>	<b>2004 CORE</b>	<b>2004 Modules</b>
<b>HEALTH TOPICS</b>				
Cardiovascular Disease		X		X (perception of risk, prevalence)
Asthma (Does not distinguish between Occupational Asthma or COPD/Emphysema)	X	X	X	X (children)
Cancer				X (screening; Breast, Prostate, Colorectal)
Diabetes Mellitus	X	X	X (prevalence)	X (perception of risk, prevalence)
Learning Disabilities				X (perception of risk)
Depression			X	X
Obesity	X (BMI*)		X (BMI)	
Birth Defects				X (perception of risk)
Reproductive Disorders				
Arthritis	X		X	X (perception of risk, management of condition)
Multiple Sclerosis				X (perception of risk)
West Nile Virus		X		
Smallpox		X		
Perception of Risk				X
<b>ENVIRONMENTAL TOPICS</b>				
Drinking Water				X (perception of risk)
Indoor Air Quality			X (perception of risk)	X (perception of risk)
Outdoor Air Pollution			X (perception of risk)	X (perception of risk)
Mold				X
Pesticide Use				X (perception of risk)
Environmental Tobacco Smoke				X (perception of risk)
Contaminants in Food				X (perception of risk)

\*Body Mass Index

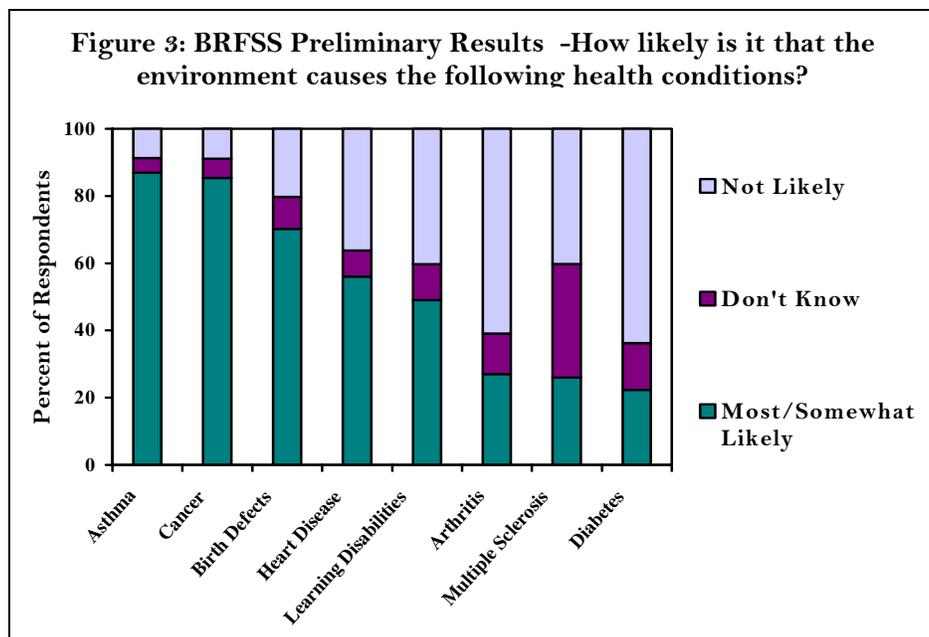
COPD: Chronic Obstructive Pulmonary Disease

Results:

The 2003 and 2004 BRFSS results are not yet available but can be utilized as environmental public health tracking (see Recommendation 6) is implemented. And although the final weighted results of the questions developed by the Assessment Committee will not be available until May 2006, the EPHTPC was presented with preliminary unweighted data based on the first three months of asking these questions (March-May 2004). In these months, 1,872 people were interviewed and the unweighted results can be found in Figure 2 below:



In these same early months the responses to the second question are found in Figure 3 below:



### Limitations:

The limitations of the BRFSS include various sampling issues and issues surrounding the questionnaire itself, which include:

- Sampling Issues
  - Telephone coverage only 97% of the population in CT. Cell phones are not included in the survey.
  - Sampling errors and standard errors
  - Response rate/bias
- Questionnaire Issues
  - Validity of questions
  - Reliability
  - Consistency over time
  - Length of survey (nearly 20 minutes)
  - Sensitive questions (i.e. income)

## **Review of Connecticut-based Environmental and Public Health Websites**

A screening method was used to determine what groups (both health and environmental) had an opinion or a position on potential and/or known environmental risks and their related health consequences. A review of various websites was conducted to assess whether any assessment work had been performed to better understand risks and concerns of Connecticut residents, or whether any issues had been prioritized for further investigation or study. A secondary intent of this review was to better understand whether or not the organizations (or their sites) provided data on environmental hazards or potentially related health concerns. It was important to include sites relating to particular illnesses or pollution types (i.e., the National Kidney Foundation and Clean Water Action), because this would provide information that would be more targeted and specific. This brief overview was done in an attempt to uncover the thoughts and ideas of this sample of organizations. The organizations sought out on the Web are listed in Appendix 8 of this report, Website Review.

Additional possible secondary assessments were identified in a number of ways; focus groups and key informant interview participants either referred or brought materials to dHA staff for inclusion in the secondary data portion of this assessment. Secondary assessments were also included based on review of websites and by recommendation of Consortium and committee members.

### ***Findings:***

#### ***Review of Websites***

Disease specific websites provided a range of results. Some, such as the website for the Connecticut Chapter of the American Lung Association, provide general information on lung disease as well as information on air quality and its effects on various respiratory illnesses. However, this website does not identify specific environmental hazards that are associated with these respiratory illnesses. Other sites such as the Connecticut Chapter of the American Liver Foundation only provide information on support groups and how to get involved in the organizations' efforts. Overall, sites such as these were not particularly helpful in providing information about the ways in which they identified potential environmental risk factors, gathered and stored information, or the environmental or health issues of concern to Connecticut residents. Other sites, such as Common Cause, provide information on state legislation, ethical practices in government, and information on advocacy.

The March of Dimes website identifies some environmental factors that are associated with various birth defects, and provides information on preventive measures that can be taken to reduce the risk of illness to babies.

Clean Water Action and Connecticut Public Interest Research Group websites provide information on some of the initiatives in Connecticut to clean up water and power supplies. An example of this is the Zero Mercury Campaign designed to distribute information to protect children and adults from harmful exposure to mercury contamination in the drinking water.

## Review of Related Secondary Assessments

The group also reviewed reports from other groups that could shed light on the health and environmental concerns of Connecticut residents. For inclusion in this analysis, the surveys had to meet one or more of the following criteria: 1) Surveys had to somehow inform the issue of environmental public health tracking; 2) Surveys had to be recent (2000), although an exception to this is the CT DEP's Citizens' Response to Environment, which is included as a model on the process of surveying Connecticut residents on their environmental concerns; and 3) surveys that had Connecticut specific results. Materials which were studies of a specific topic were also not included but were forwarded for inclusion in the literature review. For those studies included, the methods, findings, and results have been listed, where available. Those surveys that were included in the analysis were:

- Trust for America's Health (2000) Public Perceptions of Environmental Health Risks
- CDC NHANES: National Report on Human Exposure to Environmental Chemicals
- Public Health Assessment Evaluating Community Concerns in Cheshire CT, April, 2004
- Survey by Clean Water Action on Fish Poisoning in CT
- State of CT OPM: Recommended Conservation and Development Policies Plan for CT 2004-9
- Council on Environmental Quality 2002 Annual Report
- League of Conservation Voters 3<sup>rd</sup> annual survey results on CT Voters Environmental Concerns (2002-3)
- CT DEP: Citizen responses to Environment Survey (2000)
- Yale School of Forestry & Environmental Studies, Environmental Health Survey, spring, 2004 (national).

The one nationwide survey included in this analysis is the NHANES survey from the Centers for Disease Control and Prevention. While state specific data is not released (sample size is not considered large enough to release state specific data with any confidence), it is the largest, most comprehensive survey of its kind.

The committee did not locate any methodologically rigorous, broad based inquiries designed to assess current public knowledge or attitudes about health related environmental concerns in Connecticut. This was confirmed in conversations with representatives from a range of institutions, including The University of Connecticut's Center for Strategic Analysis, the Connecticut Council on Occupational Safety and Health, the Interfaith Coalition for Environmental Justice and many others. Results of the secondary assessment are summarized in Appendix 9.

Limitations:

Secondary data sources reveal data collected for another purpose and most did not fit the criteria determined by the Assessment Committee, that surveys target public perception of risk and also be specific to Connecticut.

## Focus Groups and Key Informant Interviews

The Assessment Committee developed a strategy to reach out to stakeholders through a series of Focus Groups and Key Informant Interviews.

### Methods:

Focus Group participants were organized by four distinct categories: (1) Environmental Community Groups, (2) Health Community Groups, (3) Public Health and Medical Professionals, (4) Business and Industry Representatives.

Consortium and Assessment Committee members were asked to recommend names of potential focus group participants with an emphasis on creating balanced and comprehensive groupings. Letters of invitation, detailing the Consortium background and objectives, were mailed to potential participants two weeks prior to the date of the focus group. Facilitators contacted participants by phone to confirm attendance or to request an alternate representative and/or additional referrals. Contacts were pursued until a minimum of 10 people was confirmed per group. Key Informant Interviews were scheduled with people who were unable to attend, but whose constituencies were considered significant, and who were willing to participate. The focus groups were conducted using the following questions and prompts:

- What are your key environmental or health concerns?
- Do you see a rise in certain conditions or toxins?
- From where do these concerns originate? (customers, clients, news media, etc.)
- Describe your group? What is its membership? How organized and supported?
- What are the key environmental and health concerns of your membership/ constituents?
- How would you determine their concerns?
- How does your agency, group, etc handle concerns once they are raised?
- What sort of information do you collect and what are the strengths and limitations of those data sources?
- Do you track any of this over time? How is this tracking supported?
- Does your agency/organization do any sort of organizing around health and the environment? (tracking, monitoring, etc)
- Does your agency/organization have a main mode/method of communication (website, public relations department, newsletter)? Could we receive copies/information on the above?
- If you were going to design chronic disease tracking what would you like to know?

Results:

People from a wide variety of backgrounds and interests in Connecticut were very enthusiastic about the possibility of improved environmental public health tracking. Several hundred people were contacted during the course of the Assessment process and a wide variety of people participated, representing a diversity of professional and demographic categories (see Tables below). Most participants, once they heard the premise and understood the potential, were very intent on participating, often re-arranging their schedules in order to do so. All participants expressed frustration with the level of chronic disease tracking, as well as the hope for an improved, more comprehensive and synchronized system. In addition, participants unanimously wanted to be kept informed of the Consortium’s progress and, upon request, were added to list of regular email updates. This continued involvement on the part of a wide range of stakeholders and professionals will prove useful later during the implementation phase.

The following tables contain lists of the organizations that were sought out and that participated in the primary data collection efforts.

**Table 4: Environmental Community Groups**

<b>Organization</b>	<b>Attended Focus Group</b>	<b>Unable to Attend</b>	<b>Key Informant Interview</b>
Environment and Human Health, Inc (EHHI)	X		
CT Coalition for Environmental Justice	X		
CT Fund for the Environment		X	
Toxics Action Center	X		
Clean Water Action			X
Sierra Club	X		
Farmington River Watershed Association	X		
CT Public Interest and Research Group			X
City of New Haven, Office of Environmental Health			X
CT Conference of Municipalities			
Hispanic Health Council		X	
Cancer in Cheshire			X
ConnectiCOSH		X	
Common Cause of Connecticut		X	
People’s Action for Clean Water (PACE)	X		

**Table 5: Medical and Public Health Professionals**

<b>Organization</b>	<b>Attended Focus Group</b>	<b>Unable to Attend</b>	<b>Key Informant Interview</b>
Central Area Health Education Center (AHEC)	X		
CT Association of Directors of Public Health	X		
CT Public Health Association		X	X
Ecological Health Organization	X		
School Nurse Supervisor, Wethersfield School District	X		
Member, American Academy of Pediatrics/CT Member, Environment and Human Health (EHHI)	X		
American College of Obstetricians & Gynecologists, District 1	X		
Yale University Child Study Center and Lead Program			
Local Health Department, Stratford		X	
UCONN Center on Aging		X	X
CT Hospital Association	X		
Bristol VNA Homecare Service	X		
American Lung Association, CT Chapter	X		
Autism Consultant, State Board of Education	X		
Office of Scientific Activities, State Medical Society	X		
Private Pediatrician			X

**Table 6: Health Community Groups**

<b>Organization</b>	<b>Attended Focus Group</b>	<b>Unable to Attend</b>	<b>Key Informant Interview</b>
CT Foundation for Environmentally Safe Schools	X		
Breast Cancer/ Endometriosis Awareness		X	
Learning Disabilities Association	X		
CT Families for Effective Treatment of Autism (FEAT)		X	
Info-line		X	
CT Citizens' Action Group (CCAG)	X		
Ecological Health Organization, Inc	X		
American Parkinson's Disease Association, CT Chapter		X	
Cancer in Cheshire		X	X
Chronic Fatigue and Immune Dysfunction Syndrome (CFIDS)	X		

## **Business and Industry Focus Group**

More than twenty groups were invited to participate in this focus group. However, no Key Informant Interviews were conducted for this sector. Suggestions for participants came from the CT DEP, the Connecticut Business and Industry Association (CBIA), and members of the Consortium. The eight participants included:

- Corporate health, safety and environment director
- Environmental manager
- Government relations manager
- Medical director
- Medical relations manager
- Plant environmental programs manager

These individuals had experience in air and water quality, waste management, open space and land use, occupational and environmental medicine. Industries represented included:

- Alternative energy company
- Chemical, paper specialties, insurance, aerospace, and other manufacturing industries
- Multi-national corporations
- Trade associations for general industry, petroleum and natural gas producers and distributors
- Water utility

### ***Focus Group and Key Informant Interview Findings:***

1. Data are limited for chronic disease tracking and environmental exposure assessment.
  - Participants in each of the Focus Groups and Key Informant Interviews concurred that there is a need for improved Public Health Tracking of chronic diseases in CT. Participants were generally hopeful and excited about the prospect of improvements in this area.
2. Participants noted that Connecticut has a strong system for infectious disease tracking but not for chronic disease tracking. As new systems are explored and existing systems are refined, data quality and protections will be essential.
  - Although there are various tracking systems in place for certain chronic diseases, they vary in quality, comprehensiveness, and case definition.
  - Many noted that the impact of environmental exposures on human health is very difficult to measure.
  - Tracking systems that do currently exist are designed for specific, sometimes isolated, purposes, and there is no centralized system to provide unity and oversight.
  - Adequate information on exposure and toxicology are frequently lacking and consequently pose challenges to linking health outcome data with environmental information.

- Some components of the present system(s) suffer from the lack of basic infrastructure to support consistency and quality information.
  - Tracking systems must be sure to protect the privacy and confidentiality of individuals and organizations.
3. Public health tracking must recognize new health conditions, emerging environmental hazards, and the links between the two.
    - Emerging syndromes (and symptoms) must be tracked to recognize new conditions and associations between health outcomes and environmental factors.
    - Tracking environmental exposures that are important to health outcomes is complicated; current air compliance systems have documented declines in criteria pollutants emanating from larger, highly regulated industry and power utilities. Concern is shifting to smaller industrial sources, smaller-sized and/or potentially reactive contaminants, and pollution that arise from “people”–homes (i.e. fireplaces, barbecues), –cars/traffic (less per vehicle, but more vehicles)–increased waste from disposable materials.
    - Participants believe that an aging population and associated health concerns underscore the need to improve our ability to track chronic disease.
    - Many participants believe that certain chronic health conditions are on the rise.
    - EPHT must look at diseases and environmental hazards disproportionately distributed across CT.
    - The vast majority of participants believe that there are environmental components to some of these conditions
    - Some participants believe that some emissions implicated in health outcomes are increasing.
  4. More collaboration is needed between communities, health professionals, public health agencies, researchers and environmental health agencies to develop data and policy.
    - Current tracking systems do not tend to capture the level of demographic, geographic, and other detail that would allow interested lay people and others to answer identified questions.
    - Need for additional education and outreach to inform and educate the general public on issues related to disease, adverse health outcomes, and the environment.
    - Data needs to be accessible and understandable to professional and community constituencies.
    - Environmental public health tracking should be publicly available – so that partners in the effort to prevent illness among Connecticut residents can “share the burden” of analyzing and disseminating information. Moreover, assistance should be offered to these organizations to build better partnerships between state government (CT DEP and DPH) and concerned communities and academics.
  5. Risk communication is an essential component of any expansion of EPHT efforts.
  6. Caution is needed in assessing linkages between environmental factors and health outcomes.

- Because environmental exposures are difficult to identify and measure, and because many chronic conditions are multi-factorial, there is often insufficient evidence to evaluate a potential relationship between the environment and chronic disease.
  - The absence of uniform methods – measures of environmental contaminants on the one hand and standardized case definitions and diagnostic criteria on the other – serves to complicate data collection and analysis efforts.
  - The difficulty of distinguishing perceived risk versus actual risk (e.g. media coverage may heighten concern in a time where risk is actually decreasing).
7. Environmental public health tracking should be undertaken with an eye to informing policy decisions and must be proactive.
- Improved information to use in cost/benefit assessment will serve to make recommendations for improved public health policy
8. Priorities for tracking based on the assessment efforts are shown in table 7 below:

**Table 7: Top Priorities for Environmental Public Health Tracking**

	<b>Prioritized diseases</b>	<b>Prioritized Environmental Issues</b>
Highest priority	*Asthma and other respiratory conditions Endocrine disorders Developmental Disabilities Cardiovascular disease Cancer Neurologic disorders Psychological disorders Auto-immune disorders	*Air pollution Indoor air quality Pesticides Drinking water
Medium priority	Allergies Reproduction/Fertility/BD	Asbestos Lead

\*Asthma (and other respiratory conditions) and air pollution was the top priority concern among focus group and key informant interview participants.

Limits:

The results of the focus groups and key informant interviews were limited by the following:

- These efforts constituted a sampling and responses are not necessarily representative of the entire population of CT.
- Both focus groups and key informant interviews were held during normal working hours and participants had to have some measure of schedule flexibility to participate.
- Participation was voluntary and participants may have had some pre-existing measure of commitment to individual issues.

For a complete description of the analysis and report of the findings please refer to Appendix 5.

## Consolidating and Categorizing Identified Environmental Concerns

Upon completion of both primary and secondary data collection efforts, the categories for both the environmental and health concerns were collapsed for purpose of analysis. The following table categorizes more than seventy (70) environmental hazard concerns identified in the EPHT Assessment process. The sources of these identified concerns are: (1) a biomonitoring grant survey of local health directors and environmental groups; (2) a secondary data analysis of Connecticut based environment and public health web sites; and (3) four focus groups and key informant interviews representing environmental and public health organizations, public health and medical professionals, and business/industry organizations and professionals. Complete notes and information on the collapsing of these categories is included in Appendix 6.

**Table 8: Categorization of Environmental Hazards of Concern**

AMBIENT (OUTDOOR) AIR QUALITY	AIR, SOIL and WATER QUALITY	LAND USE, SITING, and GENERAL REFERENCES
Criteria pollutants Particulates (PM 10 and PM 2.5) Diesel and sand dust Ozone Sulfur oxides Nitrogen oxides Carbon monoxide Lead Fossil fuel dependence Hazardous air pollutants Cadmium, Nickel, Mercury, Chromium and Arsenic Motor vehicle (automobile) exhausts	Radioactive materials and waste (i.e. spent fuel rods) Drinking water quality Heavy and other metals Mercury, Lead, Cadmium, Arsenic, Chromium and Nickel Volatile organic compounds Formaldehyde Pesticides Endocrine disrupters Polycyclic aromatic hydrocarbons (PAH's) 1,3-butadiene ETS Persistent biocumulative toxins PCB's, dioxin, DDT, PBDE organophosphates, organochlorides, phthalates, metals	Chemicals from nuclear power plants Chemical plants Pharmaceutical plants Trash burning (air pollution) and the solid waste crisis Stationary industrial sites Industrial manufacturing hazards Power lines Asphalt (plant) odors Electronic waste in landfills Military wastes Hazardous wastes Radioactive wastes Sewage sludge Water discharges (effluents) Transportation corridors Polyvinyl chloride Small industrial businesses
INDOOR AIR QUALITY	FOOD	OTHER
Asbestos Lead Pesticides Carbon monoxide Formaldehyde Polyflorocarbons Radon Second hand smoke (tobacco smoke) Magnetic exposures Mold Fragrances Disinfectant bi-products Indoor air quality standards	Mercury Arsenic Genetically engineered foods Additives	Loss of open space Destruction of Connecticut's native plants Global warming Flame retardants

## Consolidating and Categorizing Identified Health Concerns

While the health concerns were not initially categorized in the same way for the analysis the following categories in Table 9 mirror those above for environmental hazards.

<b>Table 9: Categorization of Health Concerns</b>		
<b>Respiratory disease</b>	<b>Birth Defects &amp; Reproductive Disorders</b>	<b>Cancer</b>
Asthma Chronic cough & sore throat General respiratory Occupational asthma Emphysema Allergies Chronic Sinusitis	Birth defects Infertility Miscarriage Endometriosis	Childhood cancers Lung Cancer
<b>Developmental disorders</b>	<b>Endocrine Disorders</b>	<b>Auto-Immune Disease</b>
Developmental disorders Autism Learning disabilities	General endocrine disorders Diabetes mellitus Thyroid	Multiple Sclerosis Diabetes Mellitus Chemical allergies
<b>Infectious/Viral agents</b>	<b>Syndromes</b>	<b>Structural Disorders</b>
Papilloma Lyme Disease Small pox West Nile Virus	Chronic fatigue Immune dysfunction/Fibromyalgia Multiple chemical sensitivities Digestive Problems	Osteoporosis Arthritis Obesity
	<b>Other</b>	
	Mercury, Arsenic, Lead Poisoning Chronic Ear Infections Headaches Rashes in school aged children Cardiovascular disease Depression Health effects from crowding and increasing stress	

## Summary of Assessment Committee Findings:

- CT has a strong system for infectious disease tracking but not for chronic disease tracking.
- Participants in the four Focus Groups and in individual Key Informant Interviews concurred that there is a need for improved tracking of chronic diseases and other adverse health outcomes in CT.
- An aging population and associated health concerns underscore the need to improve our ability to track chronic disease.
- Although there are various tracking systems in place for certain diseases and adverse health outcomes, they vary in quality, and comprehensiveness.
- Some systems attempt to collect data on diseases without well-defined case definitions.
- It is important to be able to evaluate the role that the environment plays in the development and/or progression of many chronic diseases.
- Tracking environmental exposures that are important to health outcomes is complicated.
  - E.g. Current air compliance systems have documented declines in criteria pollutants emanating from larger, highly regulated industry and power utilities. Concern is shifting to smaller industrial sources, smaller-sized and/or “potentially reactive” contaminants, and pollution that arises from “people”–homes (i.e. fireplaces, barbeques), – cars/traffic (less per vehicle, but more vehicles)–increased waste from disposable materials.
- Many noted that the impact of environmental exposures on human health is very difficult to measure.
- The absence of uniform methods to identifying and measuring environmental contaminants and lack of standardized case definitions and diagnostic criteria serves to complicate data collection and analysis efforts.
- Adequate information on exposure and toxicology are frequently lacking and consequently pose challenges to linking health outcome data with environmental information.
- Tracking systems that do currently exist are designed for specific, sometimes isolated, purposes, and there is no centralized system to provide unity and oversight.
- Some components of the present system(s) suffer from the lack of basic infrastructure to support consistency and quality information.



## Chapter Three: EPHPT Database Committee Findings

*An inventory of databases available in Connecticut showed that while many databases collect and catalog information relevant to the tracking of chronic disease and environmental exposure. These factors are tracked independently and focus on the specific goals of the collecting agency. Further, many of these databases are only partially compatible. The databases available could be modified to collect the necessary information, offering strong potential for linking some of the information collected. Making the necessary changes in the data collected is a first step to the development of an integrated tracking system.*

The Connecticut Environmental Public Health Tracking Program (CEPHTP) Database Committee began meeting in August 2003 intending to better understand the health and environmental data in Connecticut. Formed to investigate issues related to environmental and health data collection and management in Connecticut, the Database Committee was charged with defining the landscape of databases that might relate to the EPHT effort, put order to the universe of database information, and determine a direction that would set Connecticut on a course to use these resources most effectively (see Appendix 1 for

complete Mission Statement and goals.). The Database Committee began meeting in the spring of 2003 and met approximately every 6-8 weeks through the fall of 2004.

The first task that the Database Committee undertook was to conduct a database inventory. The inventory was intended to identify what health and environmental databases exist, and to begin to answer the question: “How might these databases be used to inform discussions about the connections between environmental conditions and chronic diseases and other adverse outcomes?”

CT DPH and CT DEP were the primary sources of databases that were reviewed, supplemented by selected health databases from other agencies. It was acknowledged that there are numerous databases that contain health and environmental information, both publicly and privately held. The decision to focus the inventory on “in house” databases, at least to start, was made for two reasons: first, it would greatly facilitate the initial information gathering, and second, the in-house databases would likely be the first targets in efforts to analyze, modify, and ultimately link databases together.

A questionnaire was used to gather information about the databases. A number of resources were considered as the questionnaire was developed. These included the tools used by the New York State EPHT program, the state of Nevada, and tracking work done at the national level by the Data Standards Committee. The Database Committee also heard presentations from the CT DPH’s Division of Vital Statistics and from CT DEP’s Bureau of Water Management on source water protection. From these diverse sources of input, a list was developed of components that should be present in the eventual inventory tool. The final inventory tool is shown in Appendix 10.

EPHT staff housed at CT DPH and CT DEP administered the questionnaire to the manager of each database in the spring and early summer of 2004. In addition to the questionnaires, each data manager wrote a short summary describing in simple language the purpose of the database and the information contained within it. Supporting documentation was also included when applicable. In all, sixteen health databases were inventoried representing three bureaus at CT DPH and three outside agencies. A total of seventeen environmental databases associated with air, water, waste, and Long Island Sound were inventoried at CT DEP. See Appendix 11 for a summary of the databases.

The database inventory is a first and ongoing step and begins to outline the parameters of the database landscape in Connecticut. The inventory delineates those health outcomes with databases dedicated to them, those outcomes included in more general databases, and those outcomes for which very little information is collected. Similarly, for environmental databases, the inventory outlines what information exists for potential environmental hazards. The inventory process also attempted to determine how useful the databases might be in terms of relating to each other. It considered questions such as: what is the unit of analysis, what are the time frames involved, and whether data can be exported. For environmental data, the process questioned whether the actual values are recorded or noted as falling above or below a certain threshold, the frequency and scope of analysis (e.g. number of recording stations), and any ties to geographical information systems.

Certain themes emerged throughout the work of the Database Committee. First, data collection is set up to suit the needs of the agency collecting the data, and the implications of this are immense. For example, vital records information is collected to provide specific information for the state; similarly, most environmental information is gathered to inform regulatory requirements. These databases were not designed explicitly for public health tracking. Understanding why certain databases were created in the first place greatly facilitates understanding the kinds of information they contain, and what their limitations might be. Efforts to modify databases will be most successful if they dovetail with the goals of the sponsoring organizations.

Most health and environmental databases operate independently. They were not originally designed to be networked or even coordinated. This is changing, however. The benefits of networking databases are widely recognized, and efforts are underway at the CT DPH to streamline data collection and information flow. The Connecticut Electronic Disease Surveillance System (CEDSS) system is one such initiative. It will eventually act as a central repository for information that is now spread among many bureaus and divisions at the CT DPH. The CT DPH Virtual Child's Bureau is launching another initiative called CT HIP-KIDS that will eventually centralize information about children.

The CT DEP is also rethinking how it will support effective collection, storage, and access to environmental data and also has efforts underway to improve its information management resources. One of CT DEP's efforts is the Environmental Data and Geographic Exchange Initiative (EDGE) which is focused on developing and implementing an integrated information management system where high quality, reliable and consistent enterprise data are captured and made easily accessible. A major project under EDGE is to implement an integrated facility information system that allows users to view not only a tabular set of core facility data, but also critical documents such as active permits and enforcement actions, and geographic data layers characterizing the ambient environmental conditions at the site. This project will also establish the Connecticut node on the EPA Exchange Network, which could also support the transfer of data between CT DEP and DPH as envisioned under CDC's EPHT network.

Another CT DEP effort is a data management system that will also be part of a larger statewide network of geospatial information. A Geospatial Council that reports directly to the Governor will govern this geospatial information. The purpose of a Geospatial Council is to manage information and data that can provide all levels of government and the private sector with the capabilities to carry

out detection, planning, preparedness, mitigation, response, and recovery activities for homeland security purposes that save lives and protect property. Geospatial technologies and geospatial data can be essential tools for virtually all functions of government and business.

Once geospatial data are readily available, EPHT staff will be able to quickly visualize for example, where environmental contamination is, residential areas that have been contaminated, and the percentage of the community who have developed symptoms over the course of exposure. These data layers could be overlaid to give a visual representation of the situation in a certain area. This will be the groundwork for showing if certain illnesses may be environmentally related. In order for such a system to be reputable, the data will need to be standardized, and of utmost quality.

The CT DPH and DEP initiatives have already begun driven by the underlying idea that high quality, centralized data collection and storage can serve many purposes. The goals and philosophy of these initiatives are very consistent with the goals and philosophy of EPHT, and offer many possible areas for future collaboration.

Not only does the historic context of the current databases have implications for their use in EPHT, but their institutional context matters as well. Just as the databases themselves were created to fill specific needs, so were the agencies that house them, specifically the CT DPH and DEP. Both agencies have defined mandates and workloads, with philosophies, work cultures, and language that support their mandates. Strengthening the bridge between the two agencies is both necessary and challenging. Part of the capacity building that the Database Committee began was to facilitate lengthy discussions among staff from the two agencies. Each side has begun to inform the other in terms of what their work culture is like, what might be reasonable expectations of them, and what some of their ultimate goals are. These conversations and developing relationships have helped to build a stronger partnership and provided insight to better integrate information.

Another theme that emerged from the work of the Database Committee is the need to develop indicators for health outcomes and environmental conditions. “Indicators” in this context are summary measures that define part of a possible environment-health connection. When faced with the plethora of computerized information and tasked with summarizing its utility, the challenge for the Committee was: How can we begin to organize and prioritize the information? How can the topic areas be defined or framed? The need to organize health outcomes and environmental influences logically and in ways that are consistent with the work of others, led to discussions of indicators.

Indicators for health outcomes could include sentinel events (for example, “rates of hospitalizations for acute asthma events”), potential confounders (“rates of children living below poverty level”), measured levels of environmental exposures (for example, “ambient concentrations of ozone”), exposure mediators (“number of children living in counties with high annual averages of ozone”), or even policy outcomes (“proportion of schools with indoor air policies”). The development and adoption of indicators necessarily entails discussions of “What are the specific questions of interest?” “How have others defined the problem?” “Can previously collected data be used to answer the current question(s)? And “How should data be collected to ensure that we have accurate information for a desired indicator?” Developing indicators will help focus discussions and outline concrete first steps that can be undertaken to work with the data.

The following additional, specific ideas about data collection were also discussed:

- The notion of “tracking” requires the ability to follow indicators over time so that trends can be delineated and aberrations can be detected. Therefore it is important that systems be set up to collect the same data about environmental conditions and health outcomes over time. To the extent that indicators are consistent with those used in other geographic regions and nationally, Connecticut will be able to compare its picture with others. Once longitudinal data is collected then baseline rates can be developed for environmental exposures and health outcomes. There is also the possibility to develop early warning systems in much the same way that there are sentinel surveillance systems for infectious diseases.
- Any future developments of the databases should take Geographic Information Systems (GIS) capability into account. There are vast possibilities to use GIS technology to inform relationships between environmental influences and health outcomes; many of these uses are only now being pioneered. In order to be forward thinking, GIS information should be integrated into current and future databases whenever possible.
- Currently, much of the data collected at the CT DEP is collected for regulatory purposes. As such, the variables of interest are often whether particular measurements lie above or below certain thresholds. For the purposes of relating environmental exposures to health outcomes, actual measured values will be more useful. The ability to store and retrieve data at its most granular level should be one of the guiding principles in any modifications or future developments of the DEP databases.

The final recommendations of the Database Committee seek to address shortfalls in current data collection and incorporate many of the ideas discussed above. The database inventory began the overall process by painting a picture of the current state of data collection in Connecticut. From there, the committee agreed that data collection efforts should be expanded upon and improved. Collection should be expanded in instances where little or no data are currently collected but there is interest in monitoring the health/environmental topics; for example as with learning disabilities, pesticide use, and land use. In terms of improving current data collection, the possibilities are nearly

endless and the committee needed to hone down its recommendations to contain certain principles. These principles include (1) the development of standard indicators for both health outcomes and environmental factors (2) consistent data collection over time so that baseline rates can be developed and truly “tracked” (3) streamlining and linking data together to the extent possible, ideally incorporating measures of socioeconomic status, behavior, and geocoded location; and (4) that data management systems storing environmental data by data management systems at the most granular level possible. Based on the committee’s initial assessment of data available, they recommend that initial investigations into the linking of health and environmental data begin with examinations of asthma and cardiovascular disease and their potential environmental influences, including air pollution.

## Chapter Four: Literature Review

*There is a large volume of published literature that explores relationships between environmental factors and disease. This strongly underscores interest in better understanding the relationships among disease and environmental factors, and in identifying opportunities for prevention and intervention. While many studies are suggestive of an association, inconsistent tracking of health endpoints and limitations to environmental characterization and/or quantitative exposure assessment weaken conclusions and make estimations of population burdens of environmental impact on health difficult at best. Designing a useful program to track environmental and public health information in Connecticut should acknowledge and address limitations that researchers have identified in seeking to relate environmental information to health outcomes.*

This literature review was undertaken to provide the Consortium with information on 1) the status of published information on environmental public health tracking and 2) research themes regarding environmental influences on health in the published literature. The chapter highlights selected information published subsequent to the development of the Pew Environmental Health Commission's reports: *America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network*, September 2000; and *Transition Report to the New Administration: Strengthening our Public Health Defense Against Environmental Threats*, January 2001. The literature search task complements the work of the Assessment and Database Committees.

### Review Strategy

There is a large volume of literature relevant to exploring environmental linkages with health. Topic areas for search were derived initially from the Pew Commission reports, National Institute of Environmental Health Sciences (NIEHS) Topics, the Assessment Committee process, knowledge of the literature review team; and then further expanded as directed from current literature and the Consortium's priorities. Pertinent health outcomes with

possible associations with environmental conditions and/or contaminants were listed and discussed at a Consortium meeting.

The initial Pub Med search criteria included the following limits: abstracts available for articles written in English published in 1999-2004; searched by health outcome; and detailing human and (in some categories) animal research to capture current epidemiology and toxicology information. The abstracts were reviewed to select appropriate articles for summarization with an emphasis on selecting review articles and “new research” that addressed epidemiological studies with environmental variables.

A general sense of current work on health outcomes with likely relationships to environmental exposures was gleaned from the Pub Med search and from pertinent review articles. In addition these Web sites were surveyed:

- National Institute of Environmental Health Science (NIEHS)([www.niehs.nih.gov](http://www.niehs.nih.gov))
- Centers for Disease Control and Prevention (CDC) ([www.cdc.gov](http://www.cdc.gov))
- Agency for Toxic Substances and Disease Registry (ATSDR) ([www.atsdr.gov](http://www.atsdr.gov)),
- United States Environmental Protection Agency, Environmental Indicators Initiative ([www.epa.gov/indicators/roe/](http://www.epa.gov/indicators/roe/))
- Health Effects Institute ([www.healtheffects.org](http://www.healtheffects.org)),
- The California Birth Defects Monitoring Program ([www.cbdmp.org/ef\\_waste.htm](http://www.cbdmp.org/ef_waste.htm)),
- California Environmental Health Tracking Program ([www.catracking.com](http://www.catracking.com)), and
- National Cancer Institute. Surveillance and Epidemiology End Results (SEER). [www.seer.cancer.gov/report\\_to\\_nation/1975\\_2000/](http://www.seer.cancer.gov/report_to_nation/1975_2000/).

From the broad Pub Med search and the websites a list of health outcomes with possible environmental associations was developed and reviewed with the Consortium. The group recommended which subject areas were of most interest to be summarized in this report. Because a major impetus for the environmental public health tracking initiative was concern over specific natural or man-made events with environmental hazard consequences, four situation or context specific topics were added to the selected health outcomes. This chapter summarizes current literature on the following health topics: asthma, birth defects, cancer, developmental disorders, and endocrine disruption; and on these situation or context specific topics: World Trade Center effects; Gulf War Syndrome; ambient air quality and health effects (especially cardio-pulmonary outcomes); and hazardous waste/landfill sites. Environmental agents of interest to researchers and the status of

data as discussed in the literature are noted. A section on trends in the direction of research concludes the discussion. References are noted within the discussions and correspond with a list of literature reviewed, attached at the end of the chapter.

Some research findings support associations of health outcomes with environment. Other studies argue against strong associations with exposure to environmental agents. Many of these studies bring attention to the difficulties in defining causal relationships. Toxicology often relies on animal studies to evaluate causal relationships between toxins and health. Extrapolating these findings to humans requires knowledge of how toxins interact with “target” organism; binding to receptors, metabolism, and excretion may vary. Genetics, life-style choices and other (unknown) factors affect illnesses. Sorting the impact of these factors from environmental exposures is often challenging. New understandings of interactions between these factors and the environment will change our thinking over the next decade. Additionally, characterizing the environment, identifying potential agents of disease, and assessing exposures and dose of these agents are limited by available information and methods. With a goal of establishing priorities for a national tracking network, some inconclusive studies serve to identify information gaps and underscore the need for specific environmental health tracking information.

## Asthma

*Scope of the Problem:* Asthma rates are rising worldwide especially in English speaking and in Western countries<sup>1,2</sup>. In the United States, current asthma increased 74% between 1980 and 1996, to a national prevalence of 5.5%. Children missed 14 million days of school because of asthma in 1994–96 compared with 6.6 million days in 1980–82<sup>3</sup>. Environmental factors are estimated as a major cause of asthma symptoms among American children<sup>4</sup> and the leading cause of hospital admissions among urban children and lost school productivity. The roles of ambient air pollution, indoor environments, and lifestyle/socioeconomic factors (e.g. age of exposure, urban vs. rural residence, parental education) in the induction and promotion of asthma are each areas of intense investigation<sup>5</sup>. Newer research explores multi-factorial associations.

Health effects studies have substantiated that exposure to air pollutants contribute to increased morbidity and mortality from respiratory and cardiovascular outcomes<sup>6,7</sup>. Pollutants from mobile sources are important. A retrospective study comparing health care utilization before, during, and after the Atlanta Olympic Games demonstrated that reduced traffic correlated with fewer childhood asthma events<sup>8</sup>. Studies using air monitoring data from regional sites have shown a positive association between acute increases in asthma morbidity in nearby populations and ambient particulate matter and other outdoor pollutants<sup>9,10,11</sup>. Current research focuses on mechanisms of asthma in the setting of complex mixtures<sup>12</sup>. Recent study results have implicated air pollutant exposure and lung development effects. A comprehensive multi-year epidemiological program involving 6000 children in Southern California reported that ambient air pollution is associated with both onset of asthma and asthma events<sup>13</sup>. In a prospective study that was part of this program, researchers demonstrated a chronic, adverse effect on lung development in children from the age of 10 to 18 years, that led to clinically significant deficits in attained FEV<sub>1</sub> (Forced Expiratory Volume in One Second), a lung function measurement, as children reach adulthood. The researchers correlated this with nitrogen dioxide, acid vapor, fine particulate and elemental carbon exposure<sup>14</sup>.

A report by the Institute of Medicine (IOM) in 2000 found sufficient evidence for a causal relationship between exposure to indoor allergens (produced by cats, cockroaches, house dust mites) and exacerbations of asthma<sup>15</sup>. Exposure among preschool children to environmental tobacco smoke was also found to cause asthma exacerbations. This report concluded that asthma exacerbation is better characterized than asthma etiology. A more recent IOM panel reported that exposures to mold and moisture in the indoor environment exacerbate asthma and respiratory illness<sup>16</sup>. Researchers

have shown over twice the risk for current asthma in homes with visible mold<sup>17</sup>. Specific agents in the workplace, such as high molecular weight allergens (e.g. animal proteins, pharmaceutical agents, and plant products), and some low molecular weight compounds such as isocyanates and metals, have been shown to cause new asthma in adults<sup>18</sup>.

Socio-economic and urban status have been explored as factors in asthma. Results of a cross-sectional population survey of individuals living in urban and rural communities concluded that lower socio-economic status was a factor in prevalence of chronic bronchitis but not in asthma, where proximity to traffic correlated well with asthma<sup>19</sup>. A retrospective longitudinal study concluded that doctor diagnoses of asthma were more likely provided to children with higher socio-economic status<sup>20</sup>. (The study also demonstrated the importance of consistent case definition in survey ascertainment.) Increases in asthma mortality have been reported for urban centers<sup>21</sup>. Recently in a state-wide school nurse survey of asthma prevalence in elementary school children, lower socio-economic status and urban location were associated with asthma prevalence in Connecticut school children. Considering that schools are environments which may contribute to asthma severity or prevalence, this study evaluated prevalence patterns of asthma in Connecticut school children and also characterized schools with regard to several risk factors for respiratory symptoms. Further evaluation of potential relationships between asthma and factors such as water incursion and carpets in classrooms is needed.<sup>22</sup>

Asthma is a complex and multi-factorial disease, and emerging associations with its development include genetics, obesity, diet, infectious disease, mold, and climatic change<sup>23</sup>. Current epidemiological research is focusing on the complexity of airborne pollutant mixtures, especially particulate matter and their components (e.g. the role of polyaromatic hydrocarbons), and the relationship to asthma. Other studies explore the variance of the microenvironment and personal exposures of asthmatics in order to better understand the trends and relationships between asthma and fungal/pollen spores, infections, meteorological data and outdoor airborne pollutants<sup>24</sup>. Exposure to criteria pollutants may interact with other factors in asthma severity. For example personal exposure measurements of nitrogen dioxide the week before a viral infection were associated with increased asthma severity in a cohort of asthmatic children<sup>25</sup>. The link between both pet exposure and smoking and the development of asthma at specific ages is currently under study<sup>26,27</sup>. An area of growing interest is that of indoor chemistry. A recent workshop sponsored by National Institute for Occupational Safety and Health explored the current state of knowledge regarding chemical interactions that are occurring indoors and how chemical products may interact with human

occupants to produce health effects. This evolving line of inquiry raises new concerns about substances such as cleaning agents and linoleum and provides evidence of interactions between indoor and outdoor pollutants<sup>28</sup>.

Several intervention studies have shown that the impact of a home-based comprehensive environmental intervention results in reduced asthma-associated morbidity<sup>29</sup> and in reduced allergen exposure<sup>30</sup>. Many of these intervention studies have focused on more susceptible populations at risk because of health and socioeconomic disparities<sup>31</sup>.

Exploration of international patterns of adult prevalence from the European Community Respiratory Health Survey and on pediatric prevalence from the International Study of Asthma and Allergies in Childhood led Beasley et al. to question the role of “established” risk factors. They postulate that prenatal and early-life exposures may have a major role in susceptibility for asthma<sup>32</sup>. Further evidence from recent epidemiological studies indicates that certain environmental exposures during fetal development and infancy are associated with asthma and respiratory disease<sup>33,34</sup>. The roles of genetic processes are important areas of research into the development of asthma<sup>35,36</sup>.

*Environmental Agents of Interest to Researchers:* Criteria and toxic air pollutants, chemical and biological agents in the indoor environment, indoor chemistry, socioeconomic and behavioral factors.

*Data Status:* Asthma prevalence and incidence data are lacking at the community level. Consistent and broadly accepted case definitions are critical for meaningful data collection. Criteria air pollutant monitoring information and modeling extrapolation of concentrations are available on State and Regional bases. Inventories of toxic chemicals are available. However, as research further explores the role of environmental agents in asthma and raises interest in the action of multiple environmental agents and genetics, the need for detailed environmental characterization on a community level is underscored. Efforts to quantify the contribution to indoor environments from outdoor pollution constituents are limited by dispersion processes, the reactive nature of the pollutants and analytical methods. Because indoor characterization does not lend itself to quantitative assessment of biological exposure, exposure data on indoor pollutants are highly site-specific and a challenge to adapt for data bases. Qualitative approaches to exposure assessment require refinement and evaluation as useful tools.

## Birth Defects

*Scope of the Problem:* Initiated in October 2002, the Registry database contains over 200 cases defined as an infant/child identified as having one or more birth defects at the time of birth or up to 1 year after delivery. Birth defects are the number one cause of infant mortality in the United States. Major developmental defects (e.g. heart deformities, cleft palate, Down syndrome, and neural tube) occur in approximately 122,000 of the 4 million infants born in the U.S. each year. Environmental exposures may account for 3% of all birth defects and developmental disabilities, and another 25% may be related to an interaction between genes and the environment<sup>37</sup>. A review article summarizes the studies that have explored relationship between adverse pregnancy outcomes and drinking water contaminants. With concern over chlorination by-products, the authors note moderate evidence for some associations and suggest further explorations with data from birth registries and drinking water programs<sup>38</sup>. Birth defect registries are available only in about half the states in the U.S. to evaluate the many possible risk factors associated with birth defects<sup>39</sup>. Birth defect registries have provided leads for prevention of birth defects; however, no new environmental associations have been identified using birth defects registries<sup>40</sup>.

Efforts to evaluate potential reproductive effects of dioxin have yielded conflicting results. Several epidemiological studies among US Gulf War veterans found a significantly higher rate of birth defects in their infants compared to infants of controls<sup>41</sup>. Correa-Villasenor, using reports from the Metropolitan Atlanta Congenital Defects Program, a population-based birth defects surveillance program, found that there was not strong evidence to support that Vietnam veterans had a greater risk than others in fathering children with birth defects<sup>42</sup>. Eskenazi did not find a statistically significant association between maternal serum levels of tetrachlorodibenzo-p-dioxin, (TCDD) (highest known release of TCDD from an explosion of a chemical plant) and adverse birth outcomes in a cohort of women<sup>43</sup>.

Epidemiological studies confirm that children are exposed to toxicants prenatally, when they may be particularly vulnerable to adverse health effects, during critical periods of development<sup>44,45</sup>. Maternal ingestion of toxicants from accidental contamination of toxicants in food supply, such as polybrominated biphenyls (PBB) in animal feed, indicates that exposure to the fetus occurs through the placenta and to infants via breastfeeding. Some studies found that agricultural communities of high pesticide use have an increased rate of birth malformations and fetal mortality<sup>46,47</sup>.

Exposure and health research has been hampered by the lack of reliable methods to determine fetal exposure. Researchers are developing improved methods, such as sampling of amniotic fluid at 18 weeks of gestation, to capture direct exposures to the developing fetus during sensitive stages of development<sup>48,49</sup>. Time trends of persistent organic pollutants in special populations are also being evaluated by using umbilical cord blood of infants<sup>50</sup>. Recent information on the relationship between environmental toxicants and adverse birth outcomes comes primarily from *in vitro* bioassays and animal *in vivo* studies. For example, a rodent study has shown that phthalate exposure *in utero* directly affects testicular development during fetal and neonatal testis differentiation<sup>51</sup>, and that the results may parallel human testicular dysgenesis syndrome (interrelated disorders of low sperm counts, hypospadias, cryptorchidism, and testicular germ cell cancer).

Recent studies in developmental biology have improved the knowledge of genetic and environmental exposure interactions related to some major human birth defects. For example, research indicates that specific receptor pathways may be altered by toxicants, such as dioxins, to induce lip and palate malformations<sup>52</sup>. Current research is investigating if a fetus may be more susceptible to the effects of chemical exposures if it produces variant forms of detoxification enzymes early in gestation. In a case control study among women, an increase risk of delivering infants with cleft palate was observed for combined effects of maternal occupational exposures to plastics and propellants and homozygous genotypes<sup>53</sup>. An earlier study investigating the risk factors for neural tube defects by assessing women's combined chemical occupational exposures in a case control study did not find increased risks<sup>54</sup>.

*Environmental Agents of Interest to Researchers:* pesticides, dioxins, polychlorinated biphenyls, polybrominated biphenyls, phthalates, methylmercury, bisphenol A, and other agents in plastics and propellants, environmental tobacco smoke.

*Data Status:* The data collected in birth defects registries can potentially be used to evaluate associations between birth defects and potential environmental risks, including exposures from hazardous waste sites, industrial locations, or large contaminant releases. In designing studies, however, it is important to consider the limitations of birth defect registries, as they are dependent on the factors that are recorded in the registry and in exposure databases. Because of multifactorial causation and small numbers, most studies can only be designed to detect unusually high frequencies of birth defects, or to generate hypotheses focusing on one specific association<sup>55</sup>. Some registries are hospital-based, and selection bias exists. In interpreting studies and the relationship between birth

defects and the environment, it is important to take into consideration trends over time, methodological issues of data collection, changes in the definitions of birth defects over time, and the reliability of data collection from the forms completed by reporting sources.

Many registries are inadequate to address some of the emerging issues surrounding environmental exposures. For example, children with defects that manifest themselves months or years after birth are often not included in the registry when reporting occurs upon hospital discharge following birth. Combining birth defects into one or several larger categories often occurs in studies in order to increase statistical power, and this may dilute the ability to draw clear associations between a specific defect and possible environmental exposures. Harris et al. discuss grouping cardiac defects in a database for increased utility in epidemiological studies, but conclude that specific conditions likely arise from different exposures or risk factors, and thus advocate collaborative efforts amongst registries to increase the number of cases available for study <sup>56</sup>. By the same token, incomplete information on environmental and occupational exposure sources continues to hamper determinations of relationships among environment and adverse outcome. Some states (Massachusetts and New Jersey) have improved their ability to track exposure by modeling water system characteristics and tap water data. For example, New Jersey has developed a water quality database that links data from tap water samples to maps of the public water distribution systems to allow for analysis on smaller subsystems.

The Connecticut Birth Defects Registry in the Department of Public Health is an active surveillance system developed to collect birth defect information among newborns from birth hospitals statewide, to monitor trends and patterns in birth defect incidence, and to promote education activities for the prevention of birth defects. Initiated in October 2002, the Registry database contains over 200 cases. Cases are defined as an infant or child up to 1 year old who has been identified as having one or more birth defects.

## Cancer

*Scope of the Problem:* Cancer is defined as a “malignant tumor of potentially unlimited growth that expands locally by invasion and systemically by metastasis” (Merriam-Webster Dictionary).

Summarizing research that associates cancer with environmental factors is a complicated task as different types of cancers have different and often multi-factorial determinants. The list of known and suspected human carcinogenic agents by organ provided by the Agency for Toxic Substances and Disease Registry (ATSDR) is shown in the table below:

<b>Human Carcinogenic Agent</b>		
<b>Organ</b>	<b>Known</b>	<b>Suspected</b>
<b>Lung</b>	Arsenic Asbestos Benzo(a)pyrene bis(Chloromethyl)ether Chromium Nickel subsulfide Zinc chromate Tobacco smoking Mustard gas Uranium	Acrylonitrile Beryllium Cadmium 1,2-Dibromo-3-chloropropane Polycyclic aromatic hydrocarbons (PAH)
<b>Kidney</b>	Coke oven emissions Zinc chromate	Tetrachloroethylene
<b>Bladder</b>	Benzidine Tetrachloroethylene Cyclophosphamide 4-Aminodiphenyl Tobacco smoking Chloraphazine	Tetrachloroethylene
<b>Stomach</b>	Zinc chromate	Ethylene oxide
<b>Skin</b>	Arsenic Benzo(a)pyrene Overexposure to the sun	PAH Tetrachloroethylene
<b>Liver</b>	Vinyl chloride Aflatoxin Alcoholic drinks	
<b>Mouth, pharynx, larynx, esophagus</b>	Alcoholic drinks Tobacco smoking Tobacco chewing (mouth only) Mustard gas (larynx)	
<b>Prostate</b>	Cadmium	

\*Source: Lybarger JA, Spengler RF, DeRosa CT, editors. Priority health conditions: an integrated strategy to evaluate the relationship between illness and exposure to hazardous substances. Atlanta: Agency for Toxic Substances and Disease

In consideration of risk factors, ATSDR notes that environmental exposure “somewhat raises the risk” of lung, bladder and thyroid cancers and “might raise the risk” of cancers of the prostate, stomach, oral/pharynx, liver, esophagus, larynx, and nasopharynx<sup>57</sup>. Current literature explores environmental associations with these and other cancers. Boffetta and Nyberg reviewed numerous studies and established that exposure to environmental carcinogens is linked to increased cancer risk in humans. Their review concludes that residential asbestos exposure (extrapolated from industrial exposure studies) is linked to mesothelioma, and outdoor pollution raises the relative risk of lung cancer. Other conclusions on cancer risk from outdoor pollution involvement are discussed but cautioned because of study limitations, co-factors and weak associations. For example, an increased urban/rural ratio (which may be a surrogate for additional exposures from industry and mobile sources) may implicate outdoor pollution in cancers such as mouth and throat, nasopharynx, esophagus, stomach, colon, rectum, larynx, breast, bladder and prostate<sup>58</sup>. Arsenic and organochlorine compounds found in drinking water may be associated with bladder, gastrointestinal tract and other cancers<sup>59,60</sup>. Nitrate levels in drinking water are associated with an increased risk of stomach cancer<sup>61</sup> and bladder cancer<sup>62</sup>. Other environmental risk factors associated with cancer can also be found in the literature reviews of hazardous waste/landfill sites and endocrine disrupting compounds.

Known human carcinogens, such as polycyclic aromatic hydrocarbons (PAH) are produced from the combustion of fossil fuels and are found as pollutants in outdoor air. For example, diesel exhaust (a mix of many gases and fine particles) is a probable human carcinogen based on occupational exposures, and according to several review articles, an excess risk of lung cancer may have a linear exposure-response relationship<sup>63-65</sup>. By using data from a cancer registry and population census records, a cohort study suggests an exposure-response relationship between diesel exhaust and ovarian cancer<sup>66</sup>.

Breast cancer is the leading cause of cancer death among women 35-54 years of age, and environmental factors may explain a large proportion of the incidence. Two review articles provide a summary of the environmental risk factors associated with breast cancer<sup>67,68</sup>. Epidemiological studies that focus on environmental factors may reflect negative results because of a lack of 1) exposure assessment tools, 2) information on timing of potential exposures during development, and 3) information regarding genetic risk factors. In addressing some of these factors the literature describes current innovation in characterizing exposure. For example, researchers from the Cape Cod Breast Cancer and Environment Study are exploring the use of geographic information system (GIS)

to characterize water quality within water supplies as an important component of exposure assessment. . Similar uses of GIS are employed by researchers investigating breast cancer risks in Long Island and other Northeast regions.

Epidemiological studies involving indoor air pollution and cancer risk have focused on exposures to heating fuel, cooking fuel, and fumes from frying oils with inconclusive results. The studies are most suggestive of risk of lung cancer from fumes from frying oils. Radon, a naturally occurring element is a concern. On January 13, 2005, the Surgeon General released a national advisory on radon emphasizing that interventions in homes are effective in preventing this significant environmental risk. Case-control studies involving exposure to residential radon confirms the risk to home occupants which was first observed in the occupational setting among miners<sup>69</sup>.

A special report published in the Journal of the National Cancer Institute reports on trends in cancer incidence. Generally cancer rates increased over 1975-1983, then leveled off 1983-1992 with the exception of breast and prostate cancers, and then remained largely constant 1992-1995 with the exception of breast cancer which continued to increase but at a lower rate than in the previous decade. Cigarette smoking accounts for approximately 30% of cancer deaths in United States. Tobacco, the major cause of lung cancer, is also a factor in cancer of the oral cavity, oropharynx, nasopharynx and nasal sinuses, larynx, esophagus, stomach, urinary bladder, pancreas, liver, kidney, and uterine cervix<sup>70</sup>. Environmental tobacco smoke is established as a human carcinogen by the International Agency for Research on Cancer (IARC) (website: <http://www-cie.iarc.fr/>). Meta-analyses studies of involuntary smoking and lung cancer risk in never-smokers show that there is a statistically significant and consistent association between lung cancer risk in spouses of smokers and exposure to secondhand tobacco smoke from the spouse who smokes<sup>71</sup>.

A report in the late 90s concluded that rates for major pediatric cancers have remained stable since the mid-1980's with no substantial change in incidence<sup>72</sup>. Modest increases were observed for brain/central nervous system cancers, leukemia and infant neuroblastoma. According to Wild and Kleinjans<sup>73</sup> few environmental exposures have been associated with childhood cancers. However the authors note that maternal exposure to radiation may be associated with leukemia in children. Several studies have explored environmental associations with childhood leukemia including pesticides<sup>74</sup>, hazardous air contaminants<sup>75</sup>, electric and magnetic fields<sup>76</sup>, and road traffic<sup>77,78</sup>. Results of these studies are mixed and those that suggest an association acknowledge significant limitations. However continuing work in this area is important because multiple sources of exposure to

environmental contaminants during a child's life may have a role in carcinogenicity, and multi-pathway exposure assessment modeling may prove to provide more reliable risk estimates than those currently postulated<sup>79</sup>.

Cancer research is elucidating genetic predispositions among populations. Literature about cancer and the environment is focusing on genetics, particularly metabolic polymorphisms. Metabolic polymorphisms are defined by Veneis as "...common variants in genes that encode for enzymes involved in the metabolism of carcinogens." Highly penetrant genes explain less than 5% of all cancers<sup>80,81</sup>. However, less penetrant genes and their interactions with environmental exposures are less known. Snyderwine et al. describes the importance of polymorphic enzymes and the link to bladder cancer research (e.g. N-acetyltransferases play a major role in activating or deactivating aromatic amines during human metabolic processes)<sup>82</sup>. There is current interest in exploring gene-environment interactions<sup>83</sup>.

*Environmental Agents of Interest to Researchers:* Outdoor air pollution (engine combustion products such as volatile organic compounds, nitrogen oxides, fine particulates, diesel exhaust- and toxic air emissions from stationary sources), inorganic arsenic in drinking water, pesticides, non-occupational exposure to asbestos, radon, chlorination by-products in drinking water, aromatic amines from the dye industry (e.g. 2-naphthylamine, benzidine, 4-aminobiphenyl), nitrate in drinking water, electromagnetic radiation, and other industrial sources of combustion effluent (e.g. incinerator and landfill sites).

*Data Status:* The Connecticut Tumor Registry (CTR) in the Department of Public Health is a population-based resource for examining cancer patterns in Connecticut. The registry's computerized data base of over 700,000 cancer cases includes all reported cancers diagnosed in Connecticut residents from 1935 to the present, as well as follow-up, treatment and survival data on reported cases. The CTR is one of five statewide registries designated as *Surveillance, Epidemiology, and End Results* (SEER) sites. The *National Cancer Institute* funds and manages SEER sites, which were selected for their ability to manage a high quality cancer reporting system. The CTR has a staff of 25 people, including epidemiologists, Certified Tumor Registrars, medical record technicians, information technologists, and administrative personnel.

The Annual Report to the Nation on the Status of Cancer (1975-2000) provides data and program resources for comprehensive cancer control planning, and registries are listed that might be useful for

environmental health tracking. The report is a collaboration of the American Cancer Society, the National Cancer Institute, the Centers for Disease Control and Prevention, and the North American Association of Central Cancer Registries. Limitations in data interpretation acknowledged in the report include: incomplete data (12 States do not submit cancer registry data to the system); missing demographics (long term trends are evaluated only for white and black populations); uncertainty in comparing racial and ethnic groups over time (data collected over time may not be comparable as grouping characteristics changed); and questions of comparability with other surveys such as the National Health Interview Survey<sup>84</sup>. With suggested caution in interpreting this health outcome information, State Cancer Profiles provide a user-friendly Web site with current data on cancer occurrence, risk factor, and demographic statistics. Expanded use of GIS for characterizing exposures for tracking environmental health is an important tool in understanding exposures for cancer studies.

The National Cancer Institute (NCI) is supporting a pilot study to determine the feasibility of establishing a National Network for Research on Cancer in Children (website: [http://cis.nci.nih.gov/fact/6\\_40.htm](http://cis.nci.nih.gov/fact/6_40.htm)). This network will combine databases from Childhood Cancer Group and Pediatric Oncology Group in order to better characterize childhood cancer rates<sup>85</sup>. Wisconsin has developed an information technology platform to support environmental public health tracking for childhood cancer surveillance<sup>86</sup>.

## Developmental Disorders

*Scope of the Problem:* Developmental disorders among children are of growing concern, and may range from mild impairment of social or language skills to severe and disabling autism or mental retardation. Little is known about the etiology of three major developmental disabilities: autism, cerebral palsy, and severe mental retardation. During 1997-2000, approximately 6.7% of children aged 5 to 17 were reported to have attention-deficit/hyperactivity disorder. Approximately 6 of every 1000 children were reported to have received a diagnosis of mental retardation during the same period. In response, the government has developed guidelines for assessing hazards of developmental neurotoxicity, and is providing US Children's Environmental Health Centers with funding to close the research gap regarding environmental exposures and developmental disabilities. For example, the University of California at Davis is currently conducting a large case-control study of various exposures to metals or chemicals and the development of autism (<http://www.ucdmc.ucdavis.edu>).<sup>87-89</sup>.

The effects of exposure to environmental agents with potential neurotoxic effects depends on timing and dose of the chemical agent(s). Environmental agents shown to produce developmental neurotoxicity in epidemiological studies include lead and methyl mercury<sup>90-93</sup>. Polychlorinated biphenyls (PCB), dioxins, pesticides, and ionizing radiation are also found in the literature as potential neurotoxicants. Several epidemiological studies suggest a subtle adverse effect of prenatal PCB exposure on child neurodevelopment, whereas others do not<sup>94,95</sup>. Several studies suggest a relationship between prenatal exposure to PCB and subtle deficits in cognitive development<sup>96,97</sup>. Other literature raises questions about endocrine disruptors in the environment and their effects on human health<sup>98</sup>. (See section 4.6.) Studies are focusing their attention on population differences between prenatal and postnatal exposures. Epidemiological studies are also showing that an industrialized country is a marker for an environmental risk factor for disease, such as pervasive developmental disorder<sup>99</sup>. The etiology of childhood developmental delay continues to be targeted by the research community<sup>100</sup>. Long term effects on the developing brain from exposures to lead, methyl mercury, and PCB are noted in a mission statement for public health policy directed at environmental chemicals and developmental toxicity in children. The authors call for collaboration between developmental and environmental researchers to explore environmental factors in early childhood deprivation<sup>101</sup>.

*Environmental Agents of Interest to Researchers:* Lead, mercury, polychlorinated biphenyls, dioxins, pesticides, ionizing radiation, and environmental tobacco smoke.

*Data Status:* Efforts to find an association between environmental agents and developmental disorders are hampered by differences in study design, inconsistent results, lack of mechanistic understanding of combined pollutants, insufficient information on the timing of agent exposure(s), and inadequate quantitative exposure data<sup>102</sup>. Some health data systems are useful for tracking, such as state birth defect registries and the National Health Interview Survey (<http://www.cdc.gov/nchs/nhis.htm>).

## Endocrine Disruption

*Scope of the Problem:* During the past several decades, research on endocrine disrupting chemicals has focused on the role they may play in human reproduction and the toxicological properties of the compounds. Early investigations centered on the ability of endocrine disruptors to affect the reproductive capacity of wildlife<sup>103,104</sup>. Recent studies using laboratory assays (*in vitro*) have begun to establish an understanding of the molecular mechanism of the action of endocrine disruptors<sup>105,106</sup>. Most notably, some studies have shown that the combined effect of mixtures of compounds that mimic or block estrogen (polychlorinated biphenyls [PCB], dichloro-diphenyl-trichloroethane [DDT], and bisphenol A) is additive<sup>107</sup>. To date, most scientific data from laboratory assays and experimental animals show “that exposure to endocrine-disrupting compounds during fetal development can exert qualitatively different effects than can the same exposures after birth”<sup>108</sup>. The Environmental Protection Agency is establishing a screening and testing program for endocrine disrupting chemicals to detect health effects in mammals and other animals. Scientists from the European Union, Taiwan, and the United States are continuing with epidemiological studies to learn more about human exposure and potential health effects of endocrine disruptors<sup>109-111</sup>.

Many different kinds of compounds are recognized as endocrine disrupting such as pesticides (e.g. DDT, alachlor, diazinon, atrazine, and endosulfan), plastics (bisphenol A) and industrial compounds (polychlorinated biphenyls, phthalates, brominated flame retardants). Many of these compounds were first identified to have estrogenic activity. During the past decade research has broadened to target other adverse effects in hormone-producing organs and glands such as the thyroid, pancreas, adrenal and gonads. In females, causal associations between endocrine disrupters in the environment and reproductive health are limited, but sufficient evidence is available to conclude that exposure to endocrine disrupters may disrupt the menstrual cycle, alter hormone concentrations, and alter fertility among women<sup>112-114</sup>. Epidemiological studies focusing on the relationship between breast cancer and endocrine disrupters are inconclusive<sup>115-117</sup>. Growing concern among the scientific community has shifted the debate to include the impact of exposure to endocrine disrupting agents in utero and in childhood on adult reproduction<sup>118,119</sup>.

Epidemiological studies support that male reproductive health has been adversely affected<sup>120,121</sup>, and an association with exposures of endocrine disruptors during fetal life of the male is emerging in the literature. Although there is widespread geographical variation, testicular cancer across Europe and United States is increasing<sup>122,123</sup>. Prospective studies continue to investigate the incidence of other congenital abnormalities detected at birth (e.g. cryptorchidism and hypospadias) in male infants and

are using detailed exposure assessments to determine an association with endocrine disrupting compounds (e.g. organochlorine compounds). Other studies are utilizing specific biomarkers of environmental exposures and biomarkers of male reproduction in humans<sup>124,125</sup>. Other literature differs and raises questions about the association<sup>126</sup>.

*Environmental Agents of Interest to Researchers:* pesticides (e.g. DDT, alachlor, diazinon, atrazine, and endosulfan), plastics (bisphenol A) and other chemical compounds (polychlorinated biphenyls, phthalates, brominated flame retardants).

*Data Status:* Research is needed to collect accurate information on the level and timing of exposure to endocrine disruptors in the environment among both males and females. Environmental exposures to many of the known endocrine disruptors, such as DDT and PCB, have declined in the past decade.

## Situation-specific topics

### World Trade Center

The health risks associated with the World Trade Center (WTC) disaster are addressed in a recent review article. The clinical and epidemiological assessments found that the first responders to the disaster (firefighters, police, paramedics, construction workers, volunteers) are at increased risk for asthma and respiratory symptoms, particularly persistent cough (possibly from high alkalinity dust). Observed increase in small-for-gestational-age (SGA) in a cohort of newborns to women exposed to the dust was significantly greater (2- fold) than that in a comparison population, and the authors suggested that the effect was related to maternal exposures to polycyclic aromatic hydrocarbons (PAH) and particulate. A lack of “dose-response” in terms of distance from WTC (and corresponding dust exposure) may reflect the impact of stress and/or other factors on gestation and/or the variability in the concentration of dust. . Long term surveillance of exposed individuals (community and workers at the cleanup site) will be critical to understand a number of potential associations: persistent pulmonary disease and dust exposure; incidence of mesothelioma linked to worker’s asbestos exposure; increased risk of cancer; and long term developmental impacts in the SGA infant cohort<sup>127,128</sup>.

Environmental sampling initiated within days of the disaster showed that exposures to chemicals were not uniform in the study area in New York. Health risks were evaluated by assessing the timing, duration, and chemical composition of exposures, and the proximity to Ground Zero. For example, the WTC dust was analyzed for its chemical composition and particle size distribution. WTC dust was highly alkaline and composed of the following fractions: inorganic fraction (metals, radionuclides, ionic species and asbestos) and organic fraction (PAH, PCB, polychlorinated dibenzodioxins, pesticides, dibenzofurans, phthalate esters, brominated diphenyl ethers and other hydrocarbons). Ninety-five percent of the WTC dust is composed of particulate matter greater than 10 um in diameter (PM<sub>>10</sub>), and PAH were found in greatest concentrations in this size fraction. In the first days after September 11th, airborne levels of contaminants were highly elevated above normal urban background including PM<sub>2.5</sub>, dioxin toxic equivalent (TEQ), PAH, and trace elements (e.g. chlorine, sulfur, calcium). Specific PAH air sampling of the WTC disaster shows that the primary source(s) of PAH changed during the monitoring from fires to diesel exhaust<sup>129</sup>.

Epidemiological studies are incorporating information on the geographic location of individuals, high-altitude imagery of the WTC plume with health outcomes data to better characterize personal

exposures. Mount Sinai School of Medicine has initiated the World Trade Center Worker and Volunteer Medical Screening Program, and has already examined ten thousand workers, who will be followed prospectively to assess chronic health effects. Modeling systems that include the WTC plume transport patterns are currently being linked to databases with geographical information to better refine human exposures<sup>130</sup>.

### Gulf War Syndrome.

Gulf War Syndrome is a term commonly used to describe a group of illnesses, including neurological conditions, that may be associated with exposures encountered during the Gulf War in 1991. Many of the epidemiological studies conducted in the early 1990's among Gulf War veterans failed to identify a symptom complex that is unique to Gulf War veterans, however it is now acknowledged that these veterans experience significantly more chronic and often debilitating symptoms<sup>131</sup>. Studies have established that the symptoms experienced by Gulf War veterans are not adequately explained by deployment stress or wartime trauma, and that most veterans do not have identifiable psychiatric conditions. Most recently, a factor analysis study found a consistent symptom pattern between the Gulf War veterans and the non-deployed veterans of that time, however the "...Gulf War veterans displayed a more extreme degree of expression of three underlying dimensions relative to the comparison group" <sup>132</sup>. The three "dimensions" or factors identified include psycho-physiological distress, somatic distress and arthroneuromuscular distress.

Environmental exposures and location of veterans during the war were not documented for purposes of epidemiological studies which limits understanding of environmental associations with reported symptoms. Some of the potential environmental exposures, such as oil fire smoke, have been explored as a possible cause of the medical complaints reported by veterans, but findings are inconclusive<sup>133</sup>. Other environmental exposures to consider include dust storm, chemical and biological weapons, vaccine side effects, depleted uranium in ammunition, pyridostigmine bromide (a drug used to counter nerve gases), and pesticides. Today, the military has established a U.S. Defense Medical Surveillance System, a database that contains medical records that are linked with other biological sampling results. In addition, environmental teams are monitoring the air, water, and soil as well as geographical locations of current veterans.

In September 2004, the United States Research Advisory Committee on Gulf War Veterans' Illnesses reported that many veterans' symptoms are neurological and that veterans were exposed to a variety of potentially neurotoxic substances, including a combination of acetylcholinesterase inhibitors. The

report lists three possible sources of neurological agents: a major leak of sarin nerve gas from an Iraqi ammunition dump blown up by US forces in 1991; organophosphate pesticides used to protect soldiers from desert insects; and the pyridostigmine bromide tablets taken by British and American soldiers to protect them from nerve gas. Research has shown that these substances are associated with chronic health effects<sup>134</sup>. The Committee identified that the federal research effort regarding the Gulf War veterans' illnesses has not been adequate, and that a comprehensive and focused effort is needed to address key research questions. Recommendations are provided in the report to improve progress in understanding and treating Gulf War veterans' illnesses. .

*Data Status:* These two special considerations highlight the importance of organized medical surveillance. It is critical to follow the individuals who have experienced these significant exposures to provide appropriate and timely medical care. Additionally environmental exposure data and medical information developed from these programs could be utilized to better understand the environmental health of populations such as the Gulf War veterans and communities of the World Trade disaster.

#### Ambient Air Quality and Health Effects

*Scope of the Problem:* The quality of ambient air and its potential effect on health has been of interest to many researchers. The Clean Air Act requires that the Environmental Protection Agency establish "health based standards" for "criteria pollutants" (carbon monoxide, lead, nitrogen dioxide, ozone, particulates, sulfur dioxide) and an elaborate program for controlling "hazardous" air emissions. Consequently many research efforts are directed at exploring relationships between air quality and health. Asthma exacerbations and other serious effects on the lung, increased blood pressure and other cardio-pulmonary consequences, and altered neurobehaviorial function in children (from lead exposures) have been associated with criteria pollutants. Over the last few years, major reviews of short term and long term studies have been undertaken, some specifically to assess the scientific basis of EPA rulemaking, and others focused on global issues of concern<sup>135</sup>. As the regulatory program has matured and the character of ambient air pollution has changed, attention has increasingly focused on health effects associated with exposures to nitrogen oxides, ozone and particles especially that from diesel fuels and mobile sources. (Sulfur dioxide (SO<sub>2</sub>) emissions from large combustion sources and transformation into sulfates have been implicated strongly as a factor in respiratory disease.) Time-varying factors, for example weather as well as other factors (education level of subjects, susceptibility, other pollutant exposures) have been reconsidered to reassess the association of particulate with mortality, and an association was maintained. Health effects including heart rate

variability, vascular effects, airway and systemic inflammation and cardiovascular disease incidence were explored<sup>136-138</sup>.

The potential adverse effects of ambient air pollution on health and its relation to heart disease and stroke are considered (along with other factors race, ethnicity, and lifestyle) in a recent article that coins the term “environmental cardiology”. Cardiovascular deaths were strongly associated with fine particulate, with the other criteria pollutants being factors<sup>139</sup>. In June 2004 the American Heart Association developed a scientific statement to provide healthcare professionals and regulatory agencies with a comprehensive review of the literature on air pollution and cardiovascular disease<sup>140</sup>. Several recent studies found consistent evidence using data across many U.S. cities that the level of PM<sub>10</sub> is associated with the rate of death from all causes and from cardiovascular and respiratory diseases<sup>141-145</sup>. Furthermore, a study across seven European areas suggests that SO<sub>2</sub> pollution may play a role in triggering ischemic cardiac events<sup>146</sup>. The Environmental Protection Agency has funded a study to focus on the chronic impacts of long term exposure to air pollution on cardiovascular health. Life style factors and socio-economic status are important to cardiovascular health. A review in Pediatrics provides a summary of the effects of environmental exposures on the cardiovascular system from the prenatal through adolescent time periods<sup>147</sup>, and highlights passive and active smoking as a serious risk factor for cardiovascular disease. The contribution from covariates (smoking, educational level, alcohol consumption, body-mass index, occupational exposure and diet) was y considered in an analysis of effects from long term exposure to fine particulate and the authors reported associations with lung cancer and cardiopulmonary mortality<sup>148</sup>.

*Environmental Agents of Interest to Researchers:* Particulate Matter <10 micrometers in aerodynamic diameter (PM<sub>10</sub>), Particulate Matter <2.5 micrometers in aerodynamic diameter (PM<sub>2.5</sub>), and course particles, toxic air emissions, carbon monoxide, oxides of nitrogen, sulfur dioxide, ozone, lead, mercury.

#### *Data Status:*

In the United States, individual states are required to monitor criteria pollutants depending on their attainment status. (Criteria pollutants include: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, particulate matter and lead.) Networks also monitor toxic air pollutants and permitted sources report their emissions. Particulate matter may still be monitored in some states as total suspended particulate. PM<sub>10</sub> concentrations have been monitored since 1987, and a network for collection of PM<sub>2.5</sub> data was implemented in 2000. Data is retrieved into a national system.

Accessibility of this information is improving. . The US Environmental Protection Agency maintains the “AirData” website (<http://www.epa.gov/air/data>) that provides annual summaries of both air quality measurements and information from emission inventories. Air pollution exposures vary within a metropolitan area, and key variables such as wind direction, geographic features, proximity to highways, hazardous waste sites, and other pollution sources should be included in an environmental health tracking system.

#### Hazardous waste/Landfill sites

*Scope of the Problem:* The Agency for Toxic Substances and Disease Registry in the Center for Disease Control and Prevention and programs developed under the Comprehensive Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act in the US Environmental Protection Agency (EPA) provide resources and information directed at a national response to exposures from hazardous waste sites across the country. In 1997, the EPA estimated that nearly 70 million Americans lived within four miles of a hazardous waste site<sup>149</sup>. Countries from the United Kingdom, Europe, and others (e.g. Taiwan and India) have also studied the health risks of living near industrial pollution<sup>150-154</sup>.

Health outcomes assessed in these studies include pregnancy outcomes (e.g. stillbirth rates), birth defects (e.g. congenital heart defect, facial clefts, and renal and urinary tract disorders), cancer (e.g. lung, non-Hodgkin lymphoma, bladder and leukemia), chromosomal damage, and other risks (e.g. infant low-birth weight). To date, the epidemiological studies involving industrial pollution are conflicting, however, limited evidence shows increased risk of specific congenital malformations, low-birth weight among infants and non-Hodgkin’s lymphoma<sup>155-160</sup>. Because it is difficult to ascertain exposure measurements, studies in the literature rely upon surrogates of exposure (e.g. distance of residence from a waste site), a study design that tends to decrease the sensitivity of a study or its ability to detect a true effect<sup>161</sup>. Geographic information systems are proving to be useful in solving some of these exposure classification problems<sup>162-164</sup>. Several recent studies have targeted specific industrial sources of pollution, such as incinerators and crematoriums<sup>165-167</sup>.

*Environmental Agents of Interest to Researchers:* dioxins, metals (cadmium, lead, and mercury), chemicals (pesticides and polychlorinated biphenyls) solvents in drinking (and bathing) water, waste incinerator emissions, and other air pollutants.

*Data Status:* Data base systems should incorporate the capability to assess multiple and low level environmental exposures from multiple sources, including the combination of water and air. The use of geographical information systems (GIS) will provide more details of hazardous, industrial, landfill, or incinerator sites in an area. To link GIS with health outcome, researchers propose methods to address environmental and geospatial sciences, and epidemiology<sup>168</sup> and others suggest that unique identifying numbers for tracking health outcome are required<sup>169</sup>. Other factors, such as the type of waste, age of waste, time period of operation of the landfill sites, hydro-geologic factors, geological factors, site management and engineering practices are also relevant and may be available from other database systems or community contacts. One study used census data to determine the percentage of the working population employed in specific industries, such as smelting or metallurgy, to better characterize local sources of pollution in a community. Utilizing information from newly developed databases, such as US EPA MIXTOX database (provides toxicological data on interactions of pairs of chemicals), may prove useful in understanding the health effects of mixtures from these sites. If pregnancy outcomes are under study, recording migration patterns of mothers during the pregnancy may reduce misclassifications of exposure. Documentation of personal exposures and characteristics are often excluded in ecological studies involving hazardous waste or landfill sites because of the difficulty in ascertaining this information. Data systems should include data, such as diet and time-activity patterns of exposure relative to pregnancy, to reduce exposure misclassifications. In order to assess different kinds of health risks associated with hazardous waste or landfill sites, database systems should have the ability to combine the information of several different health effect registries.

## Trends in the Direction of Research

This literature review has identified trends in the direction of current research. These trends include: environmental public health tracking method development, an emphasis on environmental exposures early in life and health outcomes, genetic factors, endocrine effects of chemical exposure, and recognition of the likelihood of multiple environmental agents affecting health.

With major efforts underway to establish environmental public health tracking researchers have identified limitations when seeking to relate environmental information with health outcomes. Litt et al., building on the charge from the Pew Environmental Health Commission to address the “fundamental information gap in our understanding of the relationship between environmental exposures and the health of the public,” surveyed state and local public health and environmental officials and identified priority health conditions suggested for tracking. The survey documented that the departments surveyed varied on tracking organization, functions, and resources; and there is a substantial need for financial and personnel resources to support a tracking infra-structure. The article reports that states track some health outcome data: 94% follow cancer, 80% infectious outbreaks, 69% birth defects, 55% asthma, 16% developmental disabilities, 12% learning disorders and 8% autoimmune diseases. Exposure data tracking was rare except for 1) lead tracked by 81% of the state public health agencies and 2) some personal air monitoring data in 25% of the states. Based on an analysis that included literature review, reliance on the Environmental Defense Fund (EDF) Scorecard program (<http://www.scorecard.org>) and examination of national health databases, the authors recommended using respiratory and neurologic diseases for health outcomes and strengthening current efforts to track cancer and birth defects. The authors acknowledged that the findings are limited by availability of epidemiologic and toxicologic information and that the EDF relied on high volume chemical reporting<sup>170</sup>. The EDF Scorecard program is heavily directed by the Environmental Protection Agency’s Toxic Release Inventory ([http://www.epa.gov/tri/2002\\_tri\\_brochure.pdf](http://www.epa.gov/tri/2002_tri_brochure.pdf)). This inventory is based on estimated releases of chemicals from production and waste facilities which the authors considered to estimate potential exposure to these chemicals.

The literature points to increasing interest in research directed at in utero and early life exposures<sup>171-173</sup> and the relationship of genetics with environmental agents<sup>174,175</sup>. Suk et al. suggests that some diseases develop through multiple stages over time, and that exposures early in life including in utero may be more significant<sup>176</sup>. Woodruff reviewed three childhood health outcomes- asthma,

childhood cancers, and neuro-developmental disorders- with respect to associations with environmental contaminants and similarly concurred on the importance of early exposures. Woodruff also suggested a multi faceted approach to explore the relationship of environmental agents with disease that included: release of contaminants, ambient concentrations, human exposures and disease outcomes<sup>177</sup>. Research is also focused on potential mechanisms. Busse et al. identifies the need for systematic study of gene-environment interactions in asthma research<sup>178</sup>. The article discusses the possible interactions of environmental agents with gene polymorphisms. Other recent literature addresses epidemiological studies that have associated environmental factors with male reproductive health outcomes<sup>179</sup>. This supports interest in researching endocrine disruption mechanisms<sup>180</sup>.

Additionally current literature<sup>181</sup> has discussed the complexity in identifying the specific environmental agent(s) in indoor environments associated with disease of concern. Not only do humans experience exposures to multiple contaminants but the chemical transformations of the pollutants with each other and with other materials encountered indoors also complicate exposure assessments.

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## Chapter 5: Recommendations

*Eleven guiding principles address the methods, the analysis, and the communication necessary for the development of a successful environmental public health tracking system. The recommendations begin with a policy recommendation that a consortium type approach be maintained. Improved systematic tracking of both disease and environmental factors, tracking of the public's environmental and health concerns and surveys of specific diseases and associated environmental factors are recommended next. Because lifestyle and economic interests have important impacts on health and the environment, tracking and analysis of the relationship between exposure risks and land use is also recommended.*

### Guiding Principles for Environmental Public Health Tracking in Connecticut

- Fundamental differences in mission present challenges for both the CT DPH and DEP as they develop an environmental public health tracking system for the state. Evaluating data sets in parallel to assess possible relationships between environmental factors and health outcomes requires new approaches in both agencies.
- Environmental public health tracking in Connecticut should consider not only those chronic diseases and other adverse health outcomes or environmental exposures that are most prevalent but also those chronic diseases and other adverse health outcomes and environmental toxins which affect vulnerable populations in the state. (e.g. children, the poor, or urban dwellers). The disproportionate burden on these populations of both chronic disease and other adverse health outcomes and environmental hazards is of great concern to the Consortium and to those whose opinions were sought during the assessment process.
- The public will need assistance in interpreting and understanding the linkages made through the environmental public health tracking system to minimize confusion and misplaced concern. A tracking system requires mechanisms for the public to ask questions of the data and to receive information in an interactive way that allows for broad discussion of the interpretation of the information.
- Understanding of the links between chronic disease and other adverse health outcomes and the environment will continue to evolve. Environmental public health tracking efforts should

utilize datasets at their most granular level and on a continuum to allow the system to change to meet new concerns.

- Environmental public health tracking should include both links between chronic disease and other adverse health outcomes and the environment that are well established and those which are emerging to be adaptable to new concerns.
- The assessment process represented an enormous effort to reach out to those groups and individuals interested in the public's health, the environment, and the linkages between the two. These efforts need to continue in the development of the environmental public health tracking system.
- The environment is understood to include a broad range of factors, including physical, chemical and radiological agents. The pathways of exposure of these potentially hazardous factors include air, water, soil and food.
- In addition to the more "traditional" environmental risk factors, environmental public health tracking should also include factors related to the built environment and the social environment. As such, environmental factors will include land use and other behavioral and social determinants.
- Plans to establish and maintain an environmental public health tracking program must include an assessment of the resources required. The cost associated with both the chronic disease and other adverse health outcomes and the environmental toxins tracked in the environmental public health tracking system must be calculated in order to ensure that support for these efforts can be maintained.
- With quality information available for risk analysis and cost/benefit assessment, an environmental public health tracking system would inform and improve both 1) overall public health policy and 2) intervention strategies to address relationships between environmental exposures and health outcomes.
- Efforts to improve information gaps should not impede efforts to reduce exposure to suspected toxins or adverse conditions based on the precautionary principle that guides public health policy.

## Environmental Public Health Tracking Consortium Recommendations

### **Recommendation 1:**

*Continue the commitment to environmental public health tracking by: A) Convening a new Consortium to inform and advise the CT DEP and CT DPH on Environmental Public Health Tracking and to assist in the implementation of the following recommendations; B) Pursuing additional funding to implement recommendations; and C) Assigning appropriate resources to accomplish all tasks.*

It is proposed that a standing Environmental Public Health Tracking Consortium be established to continue and institutionalize the role of the previous Environmental Public Health Tracking Consortium. Membership in the new Consortium would be by invitation by DEP/DPH commissioners and the tenure of the Consortium or of any member would be at the discretion of the CT DPH and DEP.

### **Recommendation 2:**

*Develop coordinated systems to systematically track chronic diseases and other adverse health outcomes and develop coordinated systems to systematically track environmental exposures.*

Health: The state should support and maintain systems that collect information on a consistent basis regarding major health indicators including birth defects, developmental impairments, obesity, respiratory disorders, cardiovascular disorders, cancer, rheumatologic diseases, and neurological disorders. The notion of “tracking” requires the ability to follow indicators over time so that trends can be delineated and exceptions detected. There is the possibility to include early warning systems, or incidence surveillance for chronic diseases and other adverse health outcomes, in much the same way that there is sentinel surveillance for infectious diseases. Information should be collected in such a way that patterns among populations can be evaluated with regard to geography, environmental exposures, socioeconomic factors, and behavioral factors.

Detailed knowledge of the health status of residents of Connecticut will inform public policy; guide the utilization of resources in prevention, treatment, and rehabilitation; and allow policy makers to assess the efficacy of these efforts.

An extensive review of the databases available in the CT DPH confirms that Connecticut does not have an agency-wide, integrated, population-based system in place to assess the health of its population. Discussions with a wide variety of public health and health care professionals indicate that important information about health and childhood development is collected in many domains, both public and private. While there are currently systems that collect data on the population of

Connecticut as a whole (BRFSS, vital records, tumor registry, lead registry), there is a need for a comprehensive, coordinated approach to disease surveillance in Connecticut with timely analysis and reporting of behavioral risk factor, morbidity and mortality data and trends. This approach should incorporate both socioeconomic measures and geography in general.

Environment: The EPHTP Consortium also recommends that the state support and maintain systems that collect information on a consistent basis regarding major environmental indicators. As with the health indicators, such information should be collected in such a way that patterns can be evaluated with regard to time, geography, environmental exposures, socioeconomic factors, sub-populations, and behavior.

A systematic review of the CT DEP databases indicates that, while a great deal of good environmental data is collected, it is not uniform in quality or format, and, like health data, it is not yet an integrated, agency wide, networked set of data systems, easily available to others.

EPHT partners need to be able to access CT DEP environmental sampling and monitoring data at the same native resolution and precision that laboratory methods (and/or field instrumentation) allow.

The Consortium recommends that CT DEP review current data management practices and investigate which data are currently stored only when they exceed applicable regulatory thresholds, and which might be summarized (aggregated) by time series, as opposed to data which are currently stored at the most granular collection level. It further recommends that CT DEP make whatever changes are feasible to existing data management systems to allow for the storage and retrieval of data at the most granular data. Any projects to improve existing or create new data management systems should incorporate this principle.

### **Recommendation 3:**

*Seek to explore: A) Emerging risks and links identified by public health and environmental science and B) concerns brought forward by the public.*

The environmental public health tracking effort will be proactive in providing education and interpretation to the public. For example, there are certain health risks that the public is concerned about (e.g., West Nile Virus) whereas others may, in fact, pose more of an actual risk (e.g., radon). On the other hand, it is also the case that often the public becomes aware of new or changing patterns of

illness prior to any scientific recognition or official involvement. Lyme Disease is a case in point<sup>2</sup>. The key in both contexts is to establish closer, and more open dialogue with members of the public, and to strengthen the educational and outreach component of state agencies.

Many participants in the various focus groups would like to see CT DEP and DPH be more responsive and available to the public, more receptive to requests from other institutions and agencies for data sharing, and more collaborative in their approach to public health issues.

On the technical front, in order to respond to new and emerging patterns of illness, the system must include the flexibility to collect new data elements as they may (or may not) relate to the condition of interest. For example, data on small point source pollutants (dry cleaners, etc) is currently collected on an insufficiently detailed basis. To capture emerging diseases, and emerging links between disease and the environment, data must be collected for future analysis down to the limits of detection and reported as continuous data to that level. Where conditions have poor case definitions or diagnostic criteria, this can also be addressed by tracking syndromic categories.

#### **Recommendation 4:**

*Develop an equivalent to the National Health and Nutrition Examination Survey (NHANES) in Connecticut, with affiliated biomonitoring, to allow tracking of both non-infectious diseases and exposure to environmental agents.*

For more than forty years, the National Center for Health Statistics has conducted a periodic survey and examination of a sample of the U.S. population to characterize the health of Americans. The National Health and Nutrition Examination Survey (NHANES) provides important information on both health status and risk factors on the population as a whole and on subsets of the population. Because its goal is to make national estimates, NHANES is not designed to provide information on a state level. A state-based HANES would be developed in partnership with the NCHS and would provide detailed information as to the distribution of risk factors, health conditions, and body burden of toxins in Connecticut residents.

Human exposures to various environmental contaminants are often inferred from modeling of ambient environmental measurements. Therefore, the information we use in forming opinions, developing regulations or legislation to limit exposure rely on implicit or explicit assumptions in the modeling process. Necessarily these assumptions impart errors to the resulting human dose

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<sup>2</sup> Steere AC. Et al. J Infect Dis 1993 Feb; 167(2): 392-400).

estimates. An obvious solution to this problem is actual measurement of compounds of interest in humans. This is called biomonitoring, and has been added to NHANES, now reported biannually, providing a "report card" of the body burden of a number of industrial chemicals and trace minerals in its National Report on Human Exposure to Environmental Chemicals. An extensive survey, physical examination, and blood and urine sampling form the basis for a sampling of the nations' exposure to more than one hundred compounds. Several thousand individuals of various ages, ethnic groups and races, and both sexes form the sample population, with over sampling of groups of particular interest (such as pregnant women, adolescents and elderly, and minority populations). Rigorous laboratory collection and analysis procedures ensure accurate and precise measurement of very low concentrations (parts per billion or less) of a variety of compounds. While the detection of a variety of compounds does not itself indicate a health problem, this type of population survey does provide an idea of background measurements and is a vast improvement on modeling alone. These nationwide measurements can also suggest priority areas for further research and study.

The NHANES results are not able to identify either chemical compounds or geographic areas for prioritized sampling within a given state or region as the number of individuals from any one area is too few. Each state should conduct similar sampling processes in order to bring more regional representation to the national data provided by NHANES. The application of survey tools and sophisticated laboratory techniques at the individual state level supplements and extends the CDC's capacity to address issues of public health concern. This process should begin with environmental exposures considered either particularly relevant or of concern regionally, and continue with those potentially linked to health outcomes. Actual measurements of body burdens of these compounds will facilitate appropriately informed regulatory or legislative decision-making regarding chemical contaminants in the environment.

A CT-HANES project would combine the expertise of the Public Health Laboratory and an Advisory Council to develop protocols to answer specific questions identified as priorities for the public health of Connecticut citizens. The extent of demographic and clinical (history and physical examination) information obtained will vary with the project. A number of new resources will be required. The number of additional laboratory staff, additional analytic capability, and the cooperation of the state Health Department's Environmental Epidemiology division and biostatisticians will need to be addressed in any proposal put forward. Laboratory input into project protocols will be necessary to ensure proper specimen collection, handling, and storage. Connecticut would work closely with the

CDC/NCHS to take advantage of their interest and recent experience in conducting community HANES to leverage state and federal resources appropriately to accomplish this goal.

**Recommendation 5:**

*Identify past, present, and future land use and development patterns use as an integral data and information base for the environmental public health tracking initiative.*

Environmental hazard releases and exposures are closely associated with land use and development patterns and their associated activities. Such activities find their way to the quality of the air we breathe and the water we drink, to the safety of the food we eat and to the conditions under which we carry out our every day activities. We are severely limited in our statewide ability to qualitatively monitor environmental hazard concentrations over time that cause exposures. We actually know very little about what the public is exposed to and at what levels, but we know a great deal about the activities that are taking place in each community.

The inferential exposure pattern is one of the particular challenges that environmental hazard and disease tracking puts before us. This raises the need to explore innovative ways of data capture, the use of information, analysis, and reporting. It is unrealistic to think that a spatial and temporal qualitative data and/or information net can be cast that would define exposures in exact terms and under all conditions. However, a geographical profile net can be cast that displays for us temporal land use patterns and fluctuations that can be linked to quantitative environmental hazard releases with or without targeted specificity.

Such an approach might move us towards the establishment of composite risk tolerances sufficient to improve quality of life. For example, are gasoline stations and associated land use and development patterns along with their generated activities a notable composite risk? What might we find if we were to overlay state cancer data or low birth weight data with land use and development pattern linkages to specific environmental hazard releases?

Many experts believe that there is disproportionate exposure burdens placed on population clusters throughout Connecticut. Established monitoring networks do not usually discover these exposures, but patterns might be discovered by innovative ways of beginning with and using land use and development pattern information. Thus, hypotheses can be uncovered for more focused investigation.

Land use and development patterns at the state and local levels are rich in historical documentation. The current resource commitment of building Geographical Information Systems is testimony to our understanding of the importance of a multi-functional display that provides linkages to the past, present and future. However, the above recommendation does not exclusively direct that the entire state should be inventoried for a multitude of potential environmental hazard releases and exposures before risk assessment can commence. Instead, it suggests that careful consideration should be given to what is inventoried before a level of effort is committed. It also provides for an immediate initiative targeting a small geographical area with a focused inventory of carefully selected environmental hazard releases and potentially associated public health disorders. This initiative should consider the identification of disproportionate risk among urban populations.

Such an informational base also has broader applications. It can be used to strengthen the development of a reliable environmental/public health tracking system. A geographical profile such as this will assist in (1) the assessment of the strengths and weaknesses of existing data and information basis; (2) the assessment of the needs and interests around health and environmental hazards; (3) the development of priority needs to address gaps in data and other forms of information; and (4) the identification of potential environmental/ disease linkages.

**Recommendation 6:**

*Initiate EPHT efforts in Connecticut through the development / enhancement of data systems and trial linkages for the following initial areas of prioritized health and environmental topics:*

The following health/ environmental topics were prioritized by the Consortium, either as a result of the needs assessment process and their clear level of interest and concern among groups in Connecticut, or because results of the database inventory suggested that they would be useful places to begin. These topics are not listed in any particular order.

*Asthma*

Improve data collection systems to collect and evaluate data regarding asthma and potentially related environmental factors.

A study in 2003 of asthma prevalence among young Connecticut elementary school children estimated an average prevalence of 9.8%. In rural schools, the mean prevalence was 8.8% and in schools in cities with a population greater than 120,000, the mean was 13.1%. Schools in the wealthiest school districts reported asthma in 6.7% of children, while those in the poorest districts reported a rate of 12.2%. Within categories of communities, there was a wide range of prevalence

rates. For example, 10% of schools in the largest cities had an asthma prevalence below 6.2% while 10% had rates that exceeded 22.9%. From this information, a pattern emerges that higher asthma prevalence correlates with poor urban environments. However, the specific factors in these environments and communities and the roles they play in supporting the higher asthma prevalence and in promoting asthma exacerbations are unclear.

The state needs to improve systems to 1) better understand the scope of asthma (prevalence, incidence, and severity) in Connecticut; 2) characterize ambient air quality, sources of air pollutants and indoor environments and 3) assess socio-economic patterns. Healthcare utilization information could be supplemented with asthma data from sources such as school health records or school nurses. An expanded scope to BRFSS survey questions that explores factors in indoor environments would provide indoor environment characterization. Data from compliance programs that monitor outdoor pollutants made more accessible, supplemented with emission characterization on a community basis would provide crucial information on ambient contaminants potentially implicated in asthma.

Understanding the causes of this growing epidemic and the apparent disparities is critical to 1) developing policies to effectively prevent asthma, and 2) establishing the contribution air pollution exposure makes to asthma severity. Efforts to understand cause require a better understanding of the distribution of asthma in the population.

#### *Lead*

Evaluate potential linkage between blood lead levels and learning disabilities as a trial link between an environmental toxin and a chronic neurological disease.

Acute absorption of large amounts of lead (Pb) by the young child is known to cause acute neurological problems. Chronic exposure to environmental lead contamination with resulting absorption by the fetus and neonate has been strongly linked to mental retardation and abnormal neurological development. Some epidemiologic and basic science research has suggested adverse effects at levels below those previously considered harmful. Moreover, health effects directly attributable to lead are likely relegated to populations that already carry an elevated burden of lead exposure. As these populations also carry a disproportionate burden of potential confounders (diet, low socio-economic status, etc), isolating the lead effect will be difficult.

Widespread blood lead screening of young children currently form a database of lead exposure that is well established both within Connecticut and the nation as a whole. However, there is no centralized,

accessible database to identify or track the children who are affected by lead, and to monitor their development, although many components do exist.

A number of state and private organizations collect and maintain data on learning disabilities but these efforts are not consistent, most significantly in terms of diagnostic criteria. Additional sources of developmental information may also include pediatrician reports, referrals for special education programs, and information from school nurses and/or developmental specialists; again these sources currently lack the uniformity and specificity required for any broad analysis. Because the data on learning disabilities is not uniform and much of the potentially confounding data is not currently collected, this line of inquiry will require an intensive, well-conceived pilot or research proposal. A first step in linking environmental exposures to learning disabilities and neurological disorders is to establish standardized data collection systems for future study and evaluation. Current and proposed databases could utilize blood lead results with GIS analysis to identify "pockets" of environmental lead for housing and abatement/ remediation evaluation. This land use-focused approach would be a reasonable initial practical application, and allow a more focused identification of a population potentially at risk for learning disabilities.

*Cardiovascular*

Explore the links between cardiovascular disease and air pollution.

The goal for this recommendation is to reduce the cardio-vascular health risk in the at risk populations through communication and to focus State air policies on those pollutant sources that generate the highest health risks. This tracking system would provide definitive information for the medical community to develop patient information and strategies. It would provide the environmental agencies with the information necessary to develop the most effective exposure reduction strategies long term. Lastly, it would provide a tool with which to evaluate the effectiveness of programs.

Two strong lines of evidence indicate relationships between cardiovascular admissions or mortality and components of air pollution, specifically CO, nitrogen oxides, sulfur dioxide, ozone and particulate. One line of studies determined the relationship between cities with differing levels of air pollutants and the other determined the relationships between high pollution and low pollution periods in the same city. Evidence of cardiovascular disease shows increased statistical relationships at levels of air pollutants in the air currently demonstrated by monitoring sites in Connecticut. The elevated exposures are both seasonal and episodic with higher exposures found in urban areas. The

cardio-vascular actions, reported in the peer-reviewed literature, appear in all age groups but seem to center on the highest at risk populations. The effects appear within 2 to 24 hours after moderate elevations in certain of the pollutants.

Cardiovascular disease is a major health risk for Connecticut's aging population. It leads to significant health care costs. Interventions that can assist in the management of cardiovascular disease would provide both a public health and economic benefit to the state. Currently, available information can identify both the sources of each of these pollutants and policies that would reduce their emissions. However, it is necessary to refine understanding of the relationships between exposures and health responses to develop timely and effective interventions.

Region I EPA and the Connecticut DEP currently provide predictions on the Internet of the air quality in each region of the state 24 hours in advance for: Overall Air Quality (AQI), ozone and particulate matter. These predictions may provide a feasible source of information for persons who are dealing with cardiovascular health conditions to take personal steps to reduce their risk of acute attacks.

The goal of the tracking is to provide time, seasonal and location specific records of air pollutant levels and cardiovascular disease hospital emergency admissions and mortality. The information should be developed to show trends in each parameter such that areas more in need of additional policy interventions can be determined.

The tracking should be conducted in a series of phases.

- The goal of Phase One is to determine which air measures or types of cardiovascular disease are sufficiently robust to provide useful tracking data.
- The goal of Phase Two is to determine the presence of spatial or temporal variation in the state for each parameter that is entered into the tracking effort.
- The goal of Phase Three is to determine cofactors that introduce bias into the tracking measures.
- The goal of Phase Four is to determine interventions that are most appropriate for the state to reduce the possible exposures and the morbidity for the state.

Since components of cardiovascular disease appear to be a short term indicators of environmental quality impacts on population health this could be an important surrogate to detect the introduction of certain classes of pollutants that are biologically active at the levels found in the environment and thus become a prevention tool.

## *Cancer*

Develop an infrastructure that will facilitate investigations of possible environmental influences on cancer rates.

The EPHTP should develop the capacity to enhance the utilization of Tumor Registry data. The Connecticut EPHTP, in conjunction with national efforts, should develop or implement cancer indicators that can be used as part of the EPHTP surveillance reports. Additionally, the EPHTP should develop methodologies to analyze Tumor Registry data using traditional and spatial techniques. These methodologies should expand on existing work already developed in the area of chronic disease analysis. The goal of this recommendation would be to have the ability to select areas of Connecticut, or the entire state, and calculate appropriate disease rates. An additional goal would be to have the capacity to include possible environmental exposures in the analysis.

The Connecticut Tumor Registry is a population-based resource for examining cancer patterns in Connecticut. The Registry's computerized database includes all reported cancers diagnosed in Connecticut residents from 1935 to the present, as well as follow-up, treatment and survival data on reported cases. All hospitals and private pathology laboratories in Connecticut are required by law to report cancer cases to the registry.

Examples of cancer analyses associated with possible environmental exposures include:

- Lung cancer and radon,
- Bladder cancer and drinking water contamination and/or chlorination by-products,
- Other specific tumor types may be examined in relation to environmental exposures including air releases, both process and accidental releases, pesticide application/run-off, and leaking underground storage tanks, among others,
- Childhood cancers should also be investigated given the shorter time frame that would need to be studied to track potential links to environmental agents.

## *Pesticides*

Develop a pesticide use and accidental exposure database.

The objective is to determine a potential population-pesticide exposure burden that is specific to pesticide class, substance and formulation. Pesticides are increasingly recognized as a public health threat and yet systems to track the use and distribution of pesticides are fledgling. Because there are different classes of pesticides, different target species, and use patterns it is important to determine the categories of use. While many pesticide classes have historical records of safe use, additional pesticides are introduced into the state every year and the uses of current compounds modified.

Combinations of exposures are of special concern as are total individual exposures that accumulate from different uses. No pesticide is without risk when misused, and all pesticides have the potential for unsuspected effects from chronic exposures. These compounds are designed for specific potent biological activity and thus require careful tracking.

The EPHTP should develop a database adequate to track the presence of the full spectrum of pesticide uses in specific geographic areas and venues. It should be based on the current methodologies for tracking the agricultural restricted use in private applications. The database should be designed to permit identification of population groups exposed or likely exposed through the use of the pesticide directly and populations potentially indirectly exposed through air, water, or soil in each location from pesticide use.

The database should include reports of complaints and pesticide poisoning by location and activity or compound involved in poisoning. It should indicate the manner of the exposure such as accidental use or drift from nearby uses, or in buildings such as stores selling the pesticide or schools that are treated with pesticides. A record of pesticide-related accidents should also be maintained.

Commercial pesticide applicators currently submit cumulative summaries of pesticide use annually. Additional data to these summaries should include location (address) of application and pest treated for. Worker protection standard record keeping would be integrated into current pesticide use records, as well.

For those pesticides sold for application by noncommercial operators, point of sale data should be recorded as a land-use surrogate for the pesticide exposures. Those businesses that involve nontrivial pesticide use such as golf courses, farms and commercial nurseries should be recorded.

The tracking should consider metrics that will indicate the relative level of use, potential for pathways of exposures through common media. Primary categories of users (commercial, homeowners, or others such as school maintenance personnel and state highway workers) should be included. The data should indicate uses that are primarily in houses as separate from uses that are focused on lawn and gardens or agriculture.

## *Water*

Expand evaluation and monitoring of data of Connecticut's water supplies.

### **Private Well Water**

The CT DEP currently collects data on private well water contamination, as part of their mandated duties in hazardous waste site investigation and remediation. This data should be considered for use in the EPHTP. The EPHTP should evaluate the usefulness of such data and consider its analysis with tools such as GIS. This data would be useful in following trends over time and space.

### **Drinking Water**

The CT DPH regularly collects data on public drinking water systems. This data includes: volatile organic compounds (VOC's), metals, pesticides, chlorination byproducts and an extensive list of other chemicals which are required to be monitored regularly by Section 19-13-B102 of the Public Health Code. Approximately 75% of the population of Connecticut (2.3 million people) is served by public water. Public water systems are required to treat water if contamination exceeds a state or a federal standard. Some exposures occurring in the past, prior to implementation of such standards, are not documented in the existing public drinking water system database. These historical exposures are documented in paper format. It would be helpful for these data to be included in the existing drinking water database. In addition, current contamination episodes are documented prior to the implementation of treatment. Local health departments also collect drinking water data as a part of the review and approval process of private drinking water supplies and also during local investigations of drinking water contamination.

The EPHTP should obtain future and past data from the Drinking Water Division of the CTDPH and from LHDs for evaluation and possible inclusion in a tracking system. In particular, data on VOCs and chlorination byproducts should be evaluated for possible linkages with health outcome data. Trend data should be developed to track the percent of drinking water that is contaminated and what percent of the population is exposed. Historic data can be looked at and form the basis of retrospective linkages with health outcome databases such as the tumor registry.

## **Summary and Action Plan:**

The EPHTPC, a collaborative effort between the CT DPH, the CT DEP, and a consortium of experts in health, medicine, environment, environmental justice, and environmental toxins, accomplished the following goals: prioritize environmental and health concerns in CT, advise the state in its development of a statewide system for tracking and monitoring environmental toxins and disease, develop a plan for the implementation of this system, and prioritize key tasks/projects in building this system. To achieve these goals, the EPHTPC and its Committees assessed major environmental and public health issues in Connecticut through the identification and review of existing secondary assessments, identified important constituents/interests not currently represented or collected among secondary assessments and synthesized this information to develop a prioritized list of environmental and health concerns. Information about current relevant state/local public health surveillance and environmental systems was compiled, the quality of inventoried databases evaluated and key issues and concerns in linking and integrating systems were identified. As a result of these efforts, a set of guiding principles and recommendations toward the development of an integrated environmental public health tracking system were defined.

In May 2005, the EPHTPC formally presented a copy of its final report to both the Commissioner of the Connecticut Department of Public Health, J. Robert Galvin, MD, MPH and the Commissioner of the Connecticut Department of Environmental Protection, Gina McCarthy, MS. Copies of the report will also be distributed to members of the Consortium, focus group participants as well as pertinent Connecticut DPH and DEP program areas. A copy of this report will be posted on the Connecticut Environmental Public Health Tracking website when fully developed.

CT EPHTP (DEP/DPH) staff will incorporate the intent of the guidelines in their activities to the best extent possible and will work to implement the recommendations defined by the Consortium. Towards these efforts, the EPHT program will continue to apply for funding sources to address these recommendations.

The EPHTP Consortium, Connecticut DPH and DEP staff would like to thank all those who contributed to this effort and look forward to continued collaboration.



## Appendices

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# Appendix 1

## *Consortium, Database, and Assessment Committee Mission Statements*



## **The Connecticut Environmental Public Health Tracking Consortium Mission Statement**

The Environmental Public Health Tracking Consortium project is a collaborative effort between the CT Department of Public Health, the CT Department of Environmental Protection, and a consortium of experts in health, medicine, environmental justice, and environmental toxins. The goal of this consortium is to:

- Prioritize environmental and health concerns in CT
- Advise the state in its development of a statewide system for tracking and monitoring environmental toxins and disease.
- Develop a plan for the implementation of this system
- Prioritize key tasks/projects in building this system

## **Connecticut Environmental Public Health Tracking Planning Consortium Assessment Committee Mission Statement**

The EPHTPC Assessment Committee will assess the major environmental and public health issues in Connecticut.

### **Process:**

- Goal 1: Identify and review existing secondary assessments
- Objective 1: Inventory existing assessments of environmental and health outcome concerns of CT residents and assess for assumptions, impact and utility.
  - Objective 2: Conduct a Literature Review regarding environmental and health concerns.
- Goal 2: Identify important constituents/interests not currently represented or collected among secondary assessments.
- Goal 3: Develop strategy to obtain primary data to fill those gaps.
- Objective 1: Survey population on their health and environmental concerns.
  - Objective 2: Survey representative groups for additional input on key concerns.
- Goal 4: Evaluate and synthesize all above information to develop a prioritized list of environmental and health concerns from this variety of sources.

## **Connecticut Environmental Public Health Tracking Planning Consortium Database Committee Mission Statement**

The EPHTPC Database Committee will provide advice and guidance on developing a tool to create a database inventory (metadata – information about a given database). The database committee will evaluate the potential for data linkages between environmental factors and human health outcomes in Connecticut. The database committee will respond to the findings of the assessment committee to develop a joint environmental/health effect hypothesis for evaluation in the future.

### **Goals and Objectives:**

Goal 1: Provide advice and recommendations on the compilation of information about current relevant state/local public health surveillance and environmental systems.

Objectives 1: Establish/Develop an inventory template for use in surveying/describing individual systems (purpose, scope, capabilities, technical characteristics, data elements, methods of collection, etc.).

Objective 2: Assist in developing a process/approach to prioritize data systems for inventorying.

Objective 3: Develop strategies to obtain information about data systems outside DEP and DPH.

Goal 2: Assist in the evaluations of the quality and condition of the inventoried databases.

Objective 1: Review the report on the agencies' databases inventory to verify identified gaps and related strengths and weaknesses.

Objective 2: Differentiate the need for adjustment of data element collection within existing databases from the need for new sampling tools (database development).

Goal 3: Assist in the development of a methodology to identify potential linkages between environmental and health effects databases.

Objective 1: Identify and validate common database characteristics of environmental and health databases that would allow linkage of data.

Objective 2: Provide the Assessment Committee with the agencies database inventory reports.

Objective 3: Respond to the findings of the Assessment Committee regarding particular identified health concerns within Connecticut, identifying applicable databases.

Goal 4: Develop recommendations relative to key issues and concerns in linking and integrating systems

Objective 1: Identify issues and provide recommendations to be considered/addressed in integrating/linking databases including but not limited to: updating and maintaining databases, privacy, access, common standards, protocols and procedures for data collection, legislation, data and architectural standards, and training in both populating and interpreting the databases.

# Appendix 2

## ***Timeline for Environmental Public Health Tracking Process***

*The following timeline was developed early in the EPHTC process to guide the EPHTC leadership and keep the group on task.*



*Environmental Public Health Tracking Consortium - Timeline*

	May-July 2003	August 2003	Sept 2003	Oct/Nov 2003
Consortium	<ul style="list-style-type: none"> <li>*Set up committee structure</li> <li>*Orient full group to process and plans</li> <li>*Solicit ideas for additional committee members</li> <li>*Review how this fits into national agenda</li> </ul>		<ul style="list-style-type: none"> <li>*Timeline/Planning – where do we want to be in a year and how do we get there</li> <li>*Overview – the Pew Report and where we are in CT</li> <li>*Updates from subcommittees</li> </ul>	
Assessment Committee		<ul style="list-style-type: none"> <li>*Set committee goals</li> <li>*Review possible BRFSS questions</li> <li>*Review secondary data (bio-monitoring grant, health director survey)</li> </ul>	<ul style="list-style-type: none"> <li>*Continue work on BRFSS questions</li> </ul>	<ul style="list-style-type: none"> <li>*Draft overall assessment plan make adjustments</li> <li>*Review outline of what assessment chapter of plan would look like.</li> </ul>
Database Committee		<ul style="list-style-type: none"> <li>*Set committee goals</li> <li>*Review overview of existing datasets</li> </ul>	<ul style="list-style-type: none"> <li>*Review databases</li> <li>*What would a DB assessment look like? What should it include?</li> </ul>	<ul style="list-style-type: none"> <li>*Review draft of database assessment (core components as used on 6-10 databases)</li> <li>*Review outline of what database review chapter of plan would look like.</li> <li>*Set up basic format of assessment overviews.</li> </ul>
Leadership Group			<ul style="list-style-type: none"> <li>*DPH/DEP hire staff</li> <li>*Develop outline of plan (Table of Contents) including audience and uses.</li> </ul>	

*Environmental Public Health Tracking Consortium - Timeline*

	December 2003	Jan/Feb 2004	March 2004	April/May 2004
Consortium	<ul style="list-style-type: none"> <li>*Presentation from subcommittees – assessment plans</li> <li>*What should plan include (examples from other states)</li> <li>*Prioritization process – components and key players to include</li> </ul>		<ul style="list-style-type: none"> <li>*Review outline of plan</li> <li>*Review preliminary results of Assessment</li> <li>*Review preliminary results of Database Review</li> </ul>	<ul style="list-style-type: none"> <li>*Review plans for prioritizing results of both assessments</li> </ul>
Assessment Committee		<ul style="list-style-type: none"> <li>*Review draft of database assessment format</li> <li>*Review assessment tools and methods key populations to include.</li> <li>*Preliminary discussion of prioritization process.</li> </ul>	<ul style="list-style-type: none"> <li>*Preliminary assessment results reviewed</li> </ul>	<ul style="list-style-type: none"> <li>*Prioritization process for health issues and environmental hazards reviewed/approved</li> </ul>
Database Committee		<ul style="list-style-type: none"> <li>*First cut at database overview review (by DPH/DEP staff) - review and comments/feedback</li> </ul>	<ul style="list-style-type: none"> <li>*Preliminary assessment results reviewed</li> </ul>	<ul style="list-style-type: none"> <li>*Prioritization process for database needs and steps required reviewed/approved</li> </ul>
Leadership Group	<ul style="list-style-type: none"> <li>*Prioritization plans – overview from both committees</li> </ul>		<ul style="list-style-type: none"> <li>*Review first draft of plan and marketing plan to test findings within key communities.</li> </ul>	<ul style="list-style-type: none"> <li>*Legislative/Policy issues discussion to prep committee work</li> </ul>

*Environmental Public Health Tracking Consortium – Timeline*

	June/Sept 2005	Oct-Dec 2005	Jan/May 2005	Jun/Sept 2005
Consortium	*Legislative and Policy Review Presentation	*Prioritization of health issues and environmental hazards reviewed with consortium for discussion *Prioritization of possible pilot projects	*Review draft of plan, priorities, and application to CDC. *Final discussion of pilot project priorities.	*Begin plans for implementation
Assessment Committee	*First cut at prioritization process of health and environmental issues	*Legislative, Policy, and Education consequences discussion		
Database Committee	*First cut at prioritization of data needs and issues	*Legislative, Policy, and Education consequences discussion		
Leadership Group	*Pilot project discussion – preliminary		*Discussion of implementation plans/ marketing/ education needs/ efforts	



# Appendix 3

## ***Consortium and Committee Meetings by Date & Topic***

*This table documents all Leadership, Consortium and Committee Meetings by date and topic*



<i>Meeting Date</i>	<i>Type of Meeting</i>	<i>Key Topics</i>
May 16, 2003	Consortium	<ul style="list-style-type: none"> <li>• Overview of the CT Environmental Public Health Tracking Program</li> <li>• Charge to Consortium and establishment of committees</li> </ul>
July 15, 2003	Leadership	<ul style="list-style-type: none"> <li>• Outline processes and committee roles</li> </ul>
August 13, 2003	Database	<ul style="list-style-type: none"> <li>• Orientation, identify databases, draft mission statement</li> </ul>
August 27, 2003	Assessment	<ul style="list-style-type: none"> <li>• Orientation, Review primary and secondary data, draft mission statement</li> </ul>
Sept 10, 2003	Database	<ul style="list-style-type: none"> <li>• Vital Statistics Data Review</li> </ul>
Sept 17, 2003	Consortium	<ul style="list-style-type: none"> <li>• National EPHTN update, Subcommittee updates, Planning Timeline</li> </ul>
Sept 17, 2003	Leadership	<ul style="list-style-type: none"> <li>• Analysis of membership and engagement, development of long term plan for consortium</li> </ul>
October 1, 2003	Assessment	<ul style="list-style-type: none"> <li>• Development of perception of risk questions for BRFSS</li> </ul>
October 8, 2003	Database	<ul style="list-style-type: none"> <li>• Finalize mission statement, review other state's inventory processes</li> </ul>
October 21, 2003	Leadership	<ul style="list-style-type: none"> <li>• Review of KII &amp; Discussion of process improvements</li> </ul>
November 13, 2003	Assessment	<ul style="list-style-type: none"> <li>• Develop plan for focus groups</li> </ul>
December 17 <sup>th</sup> 2003	Database	<ul style="list-style-type: none"> <li>• Review inventory plans and begin tool development discussion</li> </ul>
February 4, 2004	Database	<ul style="list-style-type: none"> <li>• Review draft inventory tool</li> </ul>
February 10, 2004	Assessment	<ul style="list-style-type: none"> <li>• Develop list of focus group/KII participants</li> <li>• Review focus group protocol</li> </ul>
March 3, 2004	Consortium	<ul style="list-style-type: none"> <li>• Update on national tracking efforts from CDC</li> <li>• Review preliminary assessment findings</li> </ul>
April 14, 2004	Assessment	<ul style="list-style-type: none"> <li>• Review inventory examples</li> </ul>
April 14, 2004	Leadership	<ul style="list-style-type: none"> <li>• Finalize plan for development of recommendations</li> </ul>
May 5, 2004	Database	<ul style="list-style-type: none"> <li>• Review inventory examples</li> </ul>
June 14, 2004	Assessment	<ul style="list-style-type: none"> <li>• Develop/review focus group KII findings and prepare to present to consortium</li> </ul>
June 23, 2004	Consortium	<ul style="list-style-type: none"> <li>• Prelim findings of assessment efforts</li> <li>• Update on NESCAUM work</li> </ul>
July 28, 2004	Database/ Assessment	<ul style="list-style-type: none"> <li>• Joint meeting to ensure two committees know where one another are and game plan recommendation development</li> </ul>
September 22, 2004	Consortium	<ul style="list-style-type: none"> <li>• Presentation of plan for literature review and database inventory findings</li> </ul>
September 29, 2004	Leadership	<ul style="list-style-type: none"> <li>• Develop recommendations</li> </ul>
October 20, 2004	Consortium	<ul style="list-style-type: none"> <li>• Review recommendations</li> </ul>
January 19, 2005	Consortium	<ul style="list-style-type: none"> <li>• Review first draft of plan</li> </ul>
March 30, 2005	Leadership	<ul style="list-style-type: none"> <li>• Discuss NA process and development of findings</li> <li>• Discuss NESCAUM Process and Literature Review and how to introduce it to consortium</li> </ul>
April 11, 2005	Leadership	<ul style="list-style-type: none"> <li>• Discuss prioritization process and methods</li> </ul>
May 18 <sup>th</sup> , 2005	Consortium	<ul style="list-style-type: none"> <li>• Presentation of Final Plan for EPHT to Commissioners</li> <li>• Development of plans for implementation</li> </ul>



# Appendix 4

## ***Table of Assessment Priority Findings by Source***

*This table provides an overview of. Assessment Priorities according to the following sources: Bio-monitoring Survey, Focus Groups & KII, 2003 BRFSS, and 2004 BRFSS*



**DISEASE AND OTHER ADVERSE HEALTH OUTCOMES ASSESSMENT FINDINGS BY SOURCE**

	Bio-monitoring Survey		Focus Groups & KII					2003 BRFSS	2004 BRFSS
	Local Health Departments	Community Groups	Environment Community Groups	Public Health/	Health Community	Business/ Industry	KII	Results not yet available—covered topics listed	Results not yet available—covered topics listed
Cardiovascular Disease	X			X				X	X
General Respiratory Disease	X	X	X	X		X	X		X (plus one module on childhood asthma)
Asthma	X	X	X	X		X	X	X	X
Occupational Asthma					X				
COPD	X	X		X			X		
Emphysema	X	X					X		
Cancer	X	X	X	X	X	X	X		X (Screening for Breast, Prostrate and Colorectal)
General Endocrine Disorders	X	X				X			
Diabetes Mellitus	X	X	X	X	X		X	X	X
Thyroid Disease				X		X			
Osteoporosis	X	X							
Developmental Disorders		X	X				X		
Autism	X	X	X		X		X		
Depression			X				X		X
Endometriosis	X	X							
Obesity			X				X	X	X
Allergies			X		X				
Food Allergies				X					
Chemical Allergies				X					
Chronic cough, sore throat			X						
Birth Defects	X	X	X						X
Reproductive Disorders	X	X	X			X			
Auto-Immune Disorders	X	X	X	X					
Arthritis	X	X		X				X	X
Human Papilloma Virus				X					
Lyme Disease				X					
Chronic Fatigue & Immune Dysfunction/ Fibromyalgia (CFIDS/FM)		X			X				
Multiple Chemical					X				

DISEASE AND OTHER ADVERSE HEALTH OUTCOMES ASSESSMENT FINDINGS BY SOURCE										
	Bio-monitoring Survey		Focus Groups & KII					2003 BRFSS	2004 BRFSS	
	Local Health Departments	Community Groups	Environment Community Groups	Public Health/	Health Community	Business/ Industry	KII	Results not yet available—covered topics listed	Results not yet available—covered topics listed	
Sensitivities (MCS)										
Mercury, arsenic, lead poisoning					X					
Multiple Sclerosis									X	
Chronic sinusitis, digestive problems, chronic ear infections, headaches, and rashes in school-aged children					X					
Health effects from crowding and increasing stress						X				
West Nile Virus								X		
Smallpox								X		

# Appendix 5

## *Focus Group Summary*

*This section documents and details the Focus Group findings presented in the text.*



Finding #1: Concerns about limits of data available for an environmental public health tracking system were expressed at each focus group and key informant interview. While the concerns themselves varied, the overall sense was that without careful attention to the data quality flowing into an environmental public health tracking system, the utility of the system would be flawed.

Participants noted that CT is strong at infectious disease tracking but weak at tracking chronic disease and adverse health outcomes. There was a general consensus about this. One of the major reasons is that many infectious diseases are reportable; the state is required to collect and compile infectious disease surveillance data. In contrast, information on chronic diseases and other adverse health outcomes is not collected in any comprehensive or systematic way. The following comment was made in the context of occupational disease but applies in a more general way, as well.

*“We approach these things by trying to come up with band-aids rather than look real upstream to... the policy types of decisions that could really make a difference.”*

- Local Health Department Official

With regard to environmental exposures, concern was raised that current programs do not address exposure adequately. For example, well water quality and measures of soil contamination do not assess the public's exposure to potential hazards.

*“We have sources of environmental data but that doesn't always translate into environmental exposures.”*

- Private Pediatrician

Participants were concerned about the fact that tracking only diseases (and not symptoms) will not allow for emerging illnesses or issues to be tracked. By tracking established, well-understood diseases, patterns of emerging or not-yet-defined conditions will not be evaluated. For example, individuals with Lyme Disease experienced a cluster of symptoms that was only identified as Lyme Disease after the etiologic agent was determined.

It is much more difficult to track conditions for which causes are unknown. Rheumatologic diseases and developmental problems in children are examples of conditions that are clinically defined but for which causal mechanisms have yet to be understood. Conditions such as Chronic Fatigue and Immune Dysfunction, Fibromyalgia, or Multiple Chemical Sensitivities pose another level of challenge, in that the disease processes themselves are poorly described. A tracking system for environmental public health should provide mechanisms to identify patterns in occurrence of syndromes as well as diagnosed diseases.

Within some current tracking systems, an increased level of detail would be instructive. We know, for example, that chronic disease and other adverse health outcomes are influenced by multiple factors, including genetics, socio-economic status, premature births, behavior and environmental risk factors. Current tracking systems do not tend to capture the level of demographic, geographic and other detail that would allow exploring these factors well.

*“There are various systems for tracking some of this... but if the long range goal is to look at linkages between environmental risk factors and chronic disease outcomes, the level of detail is just not there... Those are the types of systems that are just far, far from what is available to us now.”*

- Local Health Department Official

In many cases, there is no baseline established for exposure and there are no standards. The challenge becomes one of exposure assessment. Concern over mold, for example, came up in the public sector groups, particularly mold in school buildings. Individuals expressed alarm about the possibility of children becoming sick in ways that may be related to the condition of their school environment.

Finding #2. Many participants felt that there needed to be more collaborative efforts between communities, health professionals, and public agencies in terms of access to and analysis of data, as well as in policy development. They noted a need for additional education and outreach to the general public.

In some cases, participants noted that there is considerable information but that the data are sometimes difficult to interpret, even for the professionals. One expert participant noted,

*“I’ve got a lot of information, I don’t know how to interpret that information.... Lots of data out there, much of it is accessible to lots of people, we don’t have a way of evaluating it.”*

- Asthma Consultant to Board of Education

He also noted that many of his colleagues use different diagnostic criteria, which serves to further complicate any analysis. These problems would be addressed, in part, by both better access to raw data, and additional collaborative efforts between researchers and practitioners.

Additional involvement on the part of the public was another topic that came up repeatedly. Some participants felt that while they might have the skills and tools to access this information, others may not. Public health professionals need to play the middlemen between the data and the public. This means more of an emphasis on education and public health communication. On behalf of a group of medical professionals, one participant noted:

*“Most of us could find information if we really wanted to but for the majority of people even if they found it could they really understand it?”*

- Private Pediatrician

The difficulty of distinguishing perceived risk from actual risk was raised. For example, media coverage may increase the public’s perception of threat, when in actuality, there is a decreasing risk. Participants expressed concerns about the different political, financial and social agendas and interests, and how these interests might influence what is tracked. There was concern that tracking should be based on “good science”.

Finding #3: While the overall list of environmental and public health concerns were diverse, a general consensus emerged around the top and even middle priorities for inclusion in tracking efforts:

Finding #4: It was evident that individuals from a range of fields and experiences are interested in and excited about the possibilities of environmental public health tracking beginning in earnest in Connecticut. Despite this, participants also expressed a range of concerns about how specifically it might be undertaken here.

The primary concern was linkage. Participants expressed a great deal of caution and uncertainty about how to establish associations between environment and health outcome.

*“We do not have good consistent surveillance mechanisms for a lot of these. So while anecdotally we can say we’re seeing a lot of this...we don’t know if that’s a blip on the screen or if it’s a real*

*trend... We can take a guess and with some of these guesses would be fairly true, but it doesn't provide a good way to look at this long term"*

- Local Health Department Official

One participant noted that to a certain extent, it is easier to do risk analysis. More research has been done on risks, and we have animal studies from which one can extrapolate. But it is precisely this knowledge about risks that makes us anxious to hone our ability to measure exposure.

*"When we know there is a risk, we need to know how to measure it. And we don't.*

-APHA Representative

Some participants, especially physicians, were concerned about issues of personal privacy and medical confidentiality. Tracking systems need to protect the privacy of individuals and families.

Considering the substantial work that would be required, some participants emphasized the importance of involving a broad constituency in the development of environmental public health tracking to foster "buy-in" and successful implementation of an environmental public health tracking system. The need for resources was also discussed, as un-funded mandates given to local agencies often fail.

Participants discussed the "local" nature of tracking. They noted the disproportional health burden and differing environmental stresses (concentration of emission sources from industry, incineration, and transportation corridors) that vary geographically across Connecticut

*"Decisions should be based on most common conditions, conditions of most concern, but also what is happening in Connecticut."*

-Environmental Justice Expert

Another factor to consider with regard to the prioritization process is rising incidence among certain sub-sets of the population. For example, while asthma appears to be on the rise in the general population, it also appears to be disproportionately so among low income and minority populations.

Finding #5: Despite the diverse perspectives of the participants, a number of clear recommendations emerged about how environmental public health tracking should be set up, undertaken, and managed in Connecticut:

Environmental public health tracking must be flexible enough to address emerging issues; this is true both of emerging illnesses and hazards. Frequently, what determines which data are collected is often old and not helpful when changes are made (e.g. when the types of pesticides being used are changed, the regulations mandating the monitoring of their disposal, storage, and sale must be adapted).

Environmental public health tracking should begin with items of particular interest in Connecticut; for instance environmental stresses from practices in Connecticut (i.e. emissions from waste-to-energy plants), and health outcomes that appear to have higher rates in the state and the region (i.e. breast cancer, asthma) or that have differing rates in specific populations (prostate cancer in African American men, respiratory problems among inner city children).



# Appendix 6

## ***Environmental Hazard Concerns Identified for Analysis***

*EPHTC Chair, Carmine DiBattista, aided in the collapsing of the categories collected in the assessment so they could be analyzed and prioritized in appropriate groups. The results of his efforts are described below.*



## **CONSOLIDATING AND CATEGORIZING IDENTIFIED ENVIRONMENTAL HAZARD CONCERNS**

The following consolidates and categorizes more than seventy (70) identified environmental hazard concerns. The sources of these identified concerns are: (1) a bio-monitoring grant survey of local health directors and environmental groups; (2) a secondary data analysis of Connecticut based environment and public health web sites; and (3) four focus groups and key informant interviews representing environmental and public health organizations, public health and medical professionals, and business/industry organizations and professionals.

The principal challenge to this task was the limited background information that explained and supported the identification of each environmental hazard concern. However, with the exception of the secondary data analysis, the identified concerns were generated in response to prepared questions. This problem was approached through a fundamental understanding of the make-up of the principal groups responding, and a review of the prepared questions.

The diversity of the expressed environmental hazard concerns was at first seemingly without a discernable pattern. However, upon closer review and observation, categories of environmental hazard concerns began to emerge. It is recognized that others conducting this same analysis might generate a different presentation. What is most important is that all of the identified environmental hazard concerns have found an arguable place to be reported. The specific reference to an environmental hazard concern has been maintained in almost all cases.

The categories that emerged from this exercise are: (1) ambient air quality; (2) air, soil and water quality; (3) land use, siting and general references; (4) indoor air quality; (5) food; and (6) other.

Footnotes have been used for clarification, dealing with cross- references and provision of supporting information.

It is important to note that the environmental hazard concerns reported in the PEW Report and the poll at the September, 2003 Consortium meeting are well represented in the following.

The challenge will be prioritization of the concerns. The prioritization process may require further consolidation and categorization. Prioritization should consider not only the level of importance of a specific environmental hazard concern, but also the completeness and comprehensiveness of the existing environmental hazard information. This might also be said for the public health information. In building a tracking and linkage system, it will be more productive to include experimentation with information/data bases that are more complete and comprehensive than others.

Further, a priority selection should also be based on at least an idea of the future format and presentation of such information. This will allow for long-term success of the design and use of a wide-ranging electronic information management system partially built through trial and error.

## AMBIENT (OUTDOOR) AIR QUALITY

- \* Criteria pollutants (1)
  - Particulates (PM 10 and PM 2.5) (2)  
Diesel (3) and sand dust
  - Ozone
  - Sulfur oxides (4)
  - Nitrogen oxides (5)
  - Carbon monoxide
  - Lead
- \* Fossil fuel dependence (6) (9)
- \* Hazardous air pollutants (7)
  - Cadmium, Nickel, Mercury, Chromium and Arsenic (8)
- \* Motor vehicle (automobile) exhausts (9)

- (1) Criteria pollutants have established ambient air quality public health standards (NAAQS).
- (2) PM<sub>2.5</sub> or PM fine is most often referenced.
- (3) The primary pollutants of public health concern are particulates. Toxics, which include particulates, are also of public health concern.
- (4) Sulfur dioxide is the pollutant of primary concern. Further, chemical reaction forms sulfates, which are in the particulate family. Sulfur dioxide is a pollutant that qualifies for credit trading programs.
- (5) Nitrogen oxides are precursors to the formation of ozone. Further, other chemical reaction forms nitrates that are in the particulate family.
- (6) The primary pollutants of concern are sulfur dioxide and particulates from the combustion of coal and oil. Mercury is also a target pollutant along with other heavy metals. Acid gases (i.e. HCL) are of public health concern.
- (7) There are over 100 hazardous or toxic air pollutants listed by the federal EPA. Connecticut regulates 100's.
- (8) These metals were specifically referenced.
- (9) The focus is on particulates, VOC's (toxic and/or precursors to the formation of ozone) and nitrogen oxides. A VOC of particular concern is benzene. VOC's are volatile organic compounds.

## AIR, SOIL and WATER QUALITY (1)

- Radioactive materials and waste ( i.e. spent fuel rods)
- Drinking water Quality (2)
- Heavy and other metals
  - \* Mercury, Lead, Cadmium, Arsenic, Chromium and Nickel (3)
- Volatile organic compounds (4)
- Formaldehyde
- Pesticides (5)
  - Endocrine disrupters

- Polycyclic aromatic hydrocarbons (PAH's)
- 1,3-butadiene
- ETS
- Persistent biocumulative toxins
  - \*PCB's, dioxin, DDT, PBDE organophosphates, organochlorides, phthalates, metals (6)

- (1) This category contains specifically referenced environmental hazard concerns that are multi-media pollutants.
- (2) A carcinogenic by-product from chlorination is an example. Pharmaceutical wastes in ground water were specifically referenced.
- (3) These are specifically referenced.
- (4) Many VOC's are toxic in air, soil and water and many are precursors to the formation of ozone.
- (5) Specific reference was made to commercial, residential and agricultural use.
- (6) These were specifically referenced.

#### LAND USE, SITING and GENERAL REFERENCES (1)

- Chemicals from nuclear power plants
- Chemical plants
- Pharmaceutical plants
- Trash burning (air pollution) and the solid waste crisis (2)
- Stationary industrial sites
- Industrial manufacturing hazards
- Power lines
- Asphalt (plant) odors
- Electronic waste in landfills
- Military wastes (3)
- Hazardous wastes
- Radioactive wastes
- Sewage sludge (4)
- Water discharges (effluents)
- Transportation corridors
- Polyvinyl chloride (5)
- Small industrial businesses

- (1) A generated waste stream is inherent throughout this category. Further, waste streams require transportation, storage, treatment and/or disposal.
- (2) The solid waste crisis refers to waste generation that exceeds reuse, recycling and disposal capacities in Connecticut.
- (3) Manganese was specifically referenced.
- (4) Management is typically incineration and land applications.
- (5) Production and disposal were specifically referenced.

## INDOOR AIR QUALITY

- Asbestos
- Lead
- Pesticides (1)
- Carbon monoxide
- Formaldehyde
- Polyflorocarbons
- Radon
- Second hand smoke (tobacco smoke)
- Magnetic exposures (2)
- Mold (3)
- Fragrances
- Disinfectant bi-products
- Indoor air quality standards (4)

- (1) Indoor exposures for children were specifically referenced.  
(2) The examples that were given are computers and microwave ovens.  
(3) Mold in schools is specifically referenced.  
(4) There was no accompanying specificity

## FOOD

- Mercury
- Arsenic
- Genetically engineered foods
- Additives

## OTHER

Loss of open space  
Destruction of Connecticut's native plants  
Global warming  
Flame retardants

# Appendix 7

## ***Summary of Assessment and BRFSS Findings by Health and Environmental Topic Area***

*This table was developed to aid the Consortium in its development of recommendations for environmental public health tracking and includes results from the work of both the assessment and database committee.*



Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Birth Defects/ Adverse Birth Outcomes	<ul style="list-style-type: none"> <li>• Focus Groups - Birth defects were only raised as a concern in one of the focus groups (Environment/ Community Group).</li> <li>• Bio-monitoring survey - 7% of Local Health Directors (LHD's) and 29% of the Community/ Environmental/ Voluntary Health Organizations polled noted birth defects as a concern.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>
Cancer	<ul style="list-style-type: none"> <li>• Focus Groups - Cancer was raised as a concern in all four of the Focus Groups. Specific cancers of concern were breast, brain, Non-Hodgkins Lymphoma, bladder, leukemia, and lung (especially non-smoking related).</li> <li>• Key Informant Interviews – Cancer was cited in three of the seven Key Informant Interviews. One participant noted a specific concern about childhood cancer and another about the increase in Non-Hodgkins Lymphoma.</li> <li>• Bio-monitoring Surveys - Respondents were asked to rate various types of cancer, thereby making it impossible to aggregate the total number who consider cancer as a concern, but at least 42% of LHD's and 57% of Community Organizations rated cancer as a concern. The LHDs were specifically concerned about breast cancer (42%) and lung cancer (25%) while Community Groups were concerned about leukemia (50%), breast cancer (43%), Non-Hodgkins lymphoma (43%), and lung cancer (43%). Participants also listed brain cancer, prostate cancer, ovarian cancer, and childhood cancer.</li> <li>• Secondary Data Review - The <i>2002 Annual Report on Environmental Quality in CT</i> issued by the CT Council on Environmental Quality has tracked the number of new cases of breast cancer per year per 100,000 CT residents and the number of new cases of Non-Hodgkin's Lymphoma per year per 100,000 CT residents, since 1935.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked.</li> <li>• 2004 BRFSS does include questions about screening for Breast Cancer, Prostate Cancer and Colorectal Cancers.</li> </ul>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Cardiovascular Diseases/ Heart Attack	<ul style="list-style-type: none"> <li>● Focus Groups - Cardiovascular disease was listed as a concern in one of the Focus Groups (the Public Health/ Medical group).</li> <li>● Bio-monitoring Surveys - At least 61% of LHDs and 36% of Community Organizations listed cardiovascular disease as a concern. A total of 49% of the LHD's cited cardiovascular disease as one of their "Top 3" priorities.</li> </ul>	<p>Module 9 of the 2003 BRFSS asks respondents if they have ever been diagnosed with a Heart Attack/Myocardial Infarction, Angina/Coronary Heart Disease, or a Stroke and, if so, at what age. Of the 95 men and 45 women who had had heart attacks, the categories include 38% men and 48% women after 65 years old, 13.5 % men and 23.7% of women between 55 and 64 years old, 40.3% men and 24.6% women between 41 and 54 years old and 7.9% men and 3.6% women less than 40 years.</p> <p>In the highest risk age category, 37.6% of the men were white/non-Hispanic, 23.8% were other race/non-Hispanic and 68.8% were Hispanic. However, for women in the same age category, 48.2% were white/non-Hispanic and 45.5% were black or African-American.</p> <p>Of the 39 men and 38 women who had had strokes and were asked to identify their age at first stroke, the categories include 50.1% men and 62.5% women older than 65, 10.2 % men and 16.1% women between 55 and 64 years, 23.6 % men and 6.4 % women between 41 and 54 years old and 16% men and 15.1% women less than 40 years.</p> <p>In the highest risk age category for strokes, 53.8% of the men were white/non-Hispanic, 26.7% were other race/non-Hispanic and 6.9% were black or African-American. For women in the same age category, 64.8% were white/non-Hispanic and 53.7 were black or African-American and 45.4 identified themselves as Hispanic. Education and income does not appear to correlate with incidence. There are many additional questions about disease management</p>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Lead Poisoning	<ul style="list-style-type: none"> <li>• Focus Groups - Members of two focus groups (the Public Health/Medical and Health Community groups) listed lead poisoning among their greatest concerns.</li> <li>• Key Informant Interview – One participant noted that he considered lead poisoning to be on the decline and less of a problem than in the past.</li> <li>• Bio-monitoring Surveys - 47% of Local Health Directors and 21% of Community Organizations indicated lead to be of concern.</li> <li>• Secondary Data Review - In <i>The National Report on Human Exposure to Environmental Chemicals</i>, the CDC monitored exposure data for 116 environmental chemicals, including lead, for the non- institutionalized, civilian U.S. population over the 2-year period 1999-2000, demonstrating that they consider lead exposure to be of high concern.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>
Carbon Monoxide Poisoning	<ul style="list-style-type: none"> <li>• Focus Groups - Participants in one focus group (Public Health/ Medical) noted that recently there seems to be greater attention to the issue of carbon monoxide poisoning, but pointed to the fact that this may be due to increased exposure in the media or greater use of carbon monoxide detectors.</li> <li>• Bio-monitoring Surveys - 32% of the LHD’s and 29% of the Community Organizations cited carbon monoxide poisoning as a concern, yet only one person ranked it as one of their “Top 3” concerns.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Birth Defects/ Adverse Birth Outcomes	<ul style="list-style-type: none"> <li>• Focus Groups - Birth defects were only raised as a concern in one of the focus groups (Environment/ Community Group).</li> <li>• Bio-monitoring survey - 7% of Local Health Directors (LHD's) and 29% of the Community/ Environmental/ Voluntary Health Organizations polled noted birth defects as a concern.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>
Cancer	<ul style="list-style-type: none"> <li>• Focus Groups - Cancer was raised as a concern in all four of the Focus Groups. Specific cancers of concern were breast, brain, Non-Hodgkins Lymphoma, bladder, leukemia, and lung (especially non-smoking related).</li> <li>• Key Informant Interviews – Cancer was cited in three of the seven Key Informant Interviews. One participant noted a specific concern about childhood cancer and another about the increase in Non-Hodgkins Lymphoma.</li> <li>• Bio-monitoring Surveys - Respondents were asked to rate various types of cancer, thereby making it impossible to aggregate the total number who consider cancer as a concern, but at least 42% of LHD's and 57% of Community Organizations rated cancer as a concern. The LHDs were specifically concerned about breast cancer (42%) and lung cancer (25%) while Community Groups were concerned about leukemia (50%), breast cancer (43%), Non-Hodgkins lymphoma (43%), and lung cancer (43%). Participants also listed brain cancer, prostate cancer, ovarian cancer, and childhood cancer.</li> <li>• Secondary Data Review - The <i>2002 Annual Report on Environmental Quality in CT</i> issued by the CT Council on Environmental Quality has tracked the number of new cases of breast cancer per year per 100,000 CT residents and the number of new cases of Non-Hodgkin's Lymphoma per year per 100,000 CT residents, since 1935.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked.</li> <li>• 2004 BRFSS does include questions about screening for Breast Cancer, Prostate Cancer and Colorectal Cancers.</li> </ul>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Cardiovascular Diseases/ Heart Attack	<ul style="list-style-type: none"> <li>Focus Groups - Cardiovascular disease was listed as a concern in one of the Focus Groups (the Public Health/ Medical group).</li> <li>Bio-monitoring Surveys - At least 61% of LHDs and 36% of Community Organizations listed cardiovascular disease as a concern. A total of 49% of the LHD's cited cardiovascular disease as one of their "Top 3" priorities.</li> </ul>	<p>Module 9 of the 2003 BRFSS asks respondents if they have ever been diagnosed with a Heart Attack/Myocardial Infarction, Angina/Coronary Heart Disease, or a Stroke and, if so, at what age. Of the 95 men and 45 women who had had heart attacks, the categories include 38% men and 48% women after 65 years old, 13.5 % men and 23.7% of women between 55 and 64 years old, 40.3% men and 24.6% women between 41 and 54 years old and 7.9% men and 3.6% women less than 40 years.</p> <p>In the highest risk age category, 37.6% of the men were white/non-Hispanic, 23.8% were other race/non-Hispanic and 68.8% were Hispanic. However, for women in the same age category, 48.2% were white/non-Hispanic and 45.5% were black or African-American.</p> <p>Of the 39 men and 38 women who had had strokes and were asked to identify their age at first stroke, the categories include 50.1% men and 62.5% women older than 65, 10.2 % men and 16.1% women between 55 and 64 years, 23.6 % men and 6.4 % women between 41 and 54 years old and 16% men and 15.1% women less than 40 years.</p> <p>In the highest risk age category for strokes, 53.8% of the men were white/non-Hispanic, 26.7% were other race/non-Hispanic and 6.9% were black or African-American. For women in the same age category, 64.8% were white/non-Hispanic and 53.7 were black or African-American and 45.4 identified themselves as Hispanic. Education and income does not appear to correlate with incidence. There are many additional questions about disease management</p>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Lead Poisoning	<ul style="list-style-type: none"> <li>• Focus Groups - Members of two focus groups (the Public Health/Medical and Health Community groups) listed lead poisoning among their greatest concerns.</li> <li>• Key Informant Interview – One participant noted that he considered lead poisoning to be on the decline and less of a problem than in the past.</li> <li>• Bio-monitoring Surveys - 47% of Local Health Directors and 21% of Community Organizations indicated lead to be of concern.</li> <li>• Secondary Data Review - In <i>The National Report on Human Exposure to Environmental Chemicals</i>, the CDC monitored exposure data for 116 environmental chemicals, including lead, for the non- institutionalized, civilian U.S. population over the 2-year period 1999-2000, demonstrating that they consider lead exposure to be of high concern.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>
Carbon Monoxide Poisoning	<ul style="list-style-type: none"> <li>• Focus Groups - Participants in one focus group (Public Health/ Medical) noted that recently there seems to be greater attention to the issue of carbon monoxide poisoning, but pointed to the fact that this may be due to increased exposure in the media or greater use of carbon monoxide detectors.</li> <li>• Bio-monitoring Surveys - 32% of the LHD’s and 29% of the Community Organizations cited carbon monoxide poisoning as a concern, yet only one person ranked it as one of their “Top 3” concerns.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Mercury Poisoning	<ul style="list-style-type: none"> <li>• Focus Groups - Mercury poisoning was raised as a health concern in one of the Focus Groups (Health/Community).</li> <li>• Bio-monitoring Surveys – Participants were only asked about mercury as an Environmental concern, and not whether they were concerned about mercury poisoning. 42% of the LHD's and 36% of the Community Organizations listed mercury as an environmental concern.</li> <li>• Secondary Data Analysis - <i>The Zero Mercury Campaign Fish Campaign</i> polled 1400 New Englanders across six states about their knowledge of government advisories regarding mercury contamination of fish.</li> </ul>	<ul style="list-style-type: none"> <li>• Not asked</li> </ul>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Respiratory Disease/Asthma	<ul style="list-style-type: none"> <li>● Focus Groups – Asthma was cited as a concern by all four focus groups. Participants expressed a specific concern about asthma in children and occupational asthma in teachers.</li> <li>● Key Informant Interviews – Asthma was cited in six of the seven Key Informant Interviews. Childhood asthma and adult onset asthma were specifically mentioned.</li> <li>● Bio-monitoring Surveys - 60% of LHD’s and 43% of the Community Organizations named asthma as a concern. 40% of the LHD’s and 43% of Community Organizations named respiratory disease as one of their “Top 3” concerns.</li> </ul>	<p>According to the 2003 BRFSS, a total of 12.2% of the general population is at risk of developing asthma during the course of their lifetime. But a closer look at the numbers shows disparities between women, at 13.5% at risk, and men, at 10.7% at risk. This disparity remains consistent throughout the rest of the demographic categories. The lack of education has a disproportionate impact on women (12.2% at risk for the most education and 17.5% at risk for the least) and men (10.3% at risk for the most and 10.8% at risk for the least). In terms of age, 18-24 year old women have a 21.3 % lifetime risk while their male peers have a 17.0% lifetime risk. The progression differs, however, during the next few decades in interesting ways. For men, the at risk proportion drops to 13.4% in ages 25-34, drops again to 9.3% in ages 35-44, blips up to 10.9% in the 55-64 category and then drops to 8.0% for 65+. For women, however, the at risk proportion drops from 21.3% at age 18-24, to 14% at risk for ages 25-34 and remains at about 14% (14.2%, 14.4%) for the next two age categories. It rises to 15.6% in the 55-64 year old category and then drops to 7.5 % for 65+. Hispanic men are slightly more at risk than white men (13% versus 12. %) but African American women are more at risk than Hispanic Woman (16% versus 15.4%). The bottom line is that, according to the 2003 BRFSS data, the person most likely to develop asthma is an economically strapped, poorly educated African American woman between the ages of 18 to 24.</p>
Autism	<ul style="list-style-type: none"> <li>● Focus Groups - Autism was listed as a concern in two of the Focus Groups (Environment/ Community and Health/ Community).</li> <li>● Key Informant Interviews - One of the Key Informant Interviews listed autism as a concern.</li> <li>● Bio-monitoring Surveys - 9% of the LHD’s cited autism, and 14% cited learning and behavioral disorders as a concern. In the Community Organizations, 14% cited autism, and 50% cited learning and behavioral disorders as a concern.</li> </ul>	<ul style="list-style-type: none"> <li>● Not asked</li> </ul>

Topic	Assessment Findings	Behavioral Risk Factors Surveillance Survey 2003
Diabetes	<ul style="list-style-type: none"> <li>● Focus Groups - Diabetes was raised as an issue at three of the four Focus groups (Environment/ Community, Medical/ Public Health, Health/ Community).</li> <li>● Key Informant Interviews - Two of the seven Key Informant Interviews noted a concern about diabetes.</li> <li>● Bio-monitoring Surveys - 49% of the LHD's and 36% of the Community Organizations named diabetes as a concern. 30% of the LHD's and 29% of the Community Groups cited endocrine disorders as one of their "Top 3" priorities.</li> </ul>	<p>Of the 5.9% of the general population that responded that they had been told by a Doctor that they had Diabetes, 6.5% are women and 5.4% are men. But within this, African-American women have the highest proportion of all, at 9.6%, versus African-American men at 4.8%. Hispanic women are right at the national average, while Hispanic men are lower, at 2.4%. The impact of education and income on Diabetes is evident in the BRFSS data. The percentage of people who have been told they have Diabetes and have less than a High School education (8.8%) is slightly more than double the percentage of people who have been told they have Diabetes and are College Graduates ( 4.2%). Income has an even more significant impact. The percentage of people who have been told they have Diabetes and whose household income is less than \$15,000 (12.7%) is more than four times the percentage of people who have been told they have Diabetes and who have a household income of \$75,000 or more (2.9%).</p> <p>Module 1 contains additional information on age of respondent when told he/she had Diabetes. A total of 3.3% were 1-15 years, 9% were 16-30 years old, 21.3% were 31-45 years old, 37.8% were 46 - 60 years old and 28.7% were 60 years or older. In the youngest age category, girls were almost double boys (4.8% versus 1.8%). Subsequent decades are comparable but among 46 -60 year olds, men outnumber women (43.8% versus 31.2%), while at 60 years or older, women outnumber men (34% versus 23.8). The number of white females less than 15 years old when told they had Diabetes is more than five times greater than their white male peers (5.5% versus 0.9%). The next discrepancy comes at age 46 -60, with males at 44.3% and females at 29.8%. After 60 years, white males represent 25.7% and white females 40.3%. With total sample sizes of 14 African-American women and 6 African-American men, 15 Hispanic women and 5 Hispanic men, these Module 1 categories are too small to look at specific variables.</p>



# Appendix 8

## ***Website Review of Organizations with Information Related to Environmental Public Health Tracking***

*This appendix is a review of relevant organizations that have sites on the Web. Note that this research was done in the summer of 2004. There may have been organizational or website changes since that time.*



<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
<i>CT Agricultural Experiment Station Dr. John Anderson PO Box 1106 New Haven, CT 06504 <a href="mailto:John.F.Anderson@po.state.ct.us">John.F.Anderson@po.state.ct.us</a></i>	<a href="http://www.caes.state.ct.us">http://www.caes.state.ct.us</a>	This site provides contact information on issues ranging from soil testing to power plant information.	No	Yes	No	No
<i>American Cancer Society, CT Chapter Barnes Park South P.O. Box 410 14 Village Lane Wallingford, CT 06492 (203) 265-7161 <a href="mailto:john.weber@cancer.org">john.weber@cancer.org</a></i>	<a href="http://www.cancer.org">www.cancer.org</a>	There is no mention of information on environmental hazards related to cancer.	Yes	No	No	No
<i>American Cancer Society, Southern New England Region Meriden Executive Park, 538 Preston Ave, Meriden, CT 06450 (203) 379-4700</i>	<a href="http://www.cancer.org">www.cancer.org</a>	This website provides links to the national website, which enables you to search for cancer information in CT based on zip code. Also provides data on state cancer rates, legislative advocacy and prevention information	Yes	No	No	No
<i>American Liver Foundation CT Chapter One Bradley Road Suite 405 Woodbridge, CT 06525 (203) 397-5433 <a href="mailto:ctalf@aol.com">ctalf@aol.com</a></i>	<a href="http://www.ctalf.org/">http://www.ctalf.org/</a>	This site provides information on support groups and seminars for individuals who suffer from liver disease.	Yes	No	No	No
<i>American Lung Association, Hartford Regional Office, 45 Ash Street, East Hartford, CT 06108 (860) 289-5401</i>	<a href="http://www.alact.org">www.alact.org</a>	The website provides information on air quality and its effect on lung health. There are advocacy sections dealing with vehicle donation and the smoking ban in public areas.	Yes	Yes	Yes	Yes

<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
<i>American Parkinson Disease Association, Gladys K Tiedemann gladkt@hotmail.com, Donna Diaz ddiaz@srhs.org</i>	<a href="http://www.apdaparkinson.org">www.apdaparkinson.org</a>	There is information on grants and fellowships for research on Parkinson's Disease, as well as informational booklets, etc. There is also a section publication that links you to annual reports, etc.	No	No	No	No
<i>Arthritis Foundation CT Chapter Cold Spring Road, Suite 411 Rocky Hill, CT 06067 (860) 563-1177 dmccaig@arthritis.org</i>	<a href="http://www.arthritis.org/">http://www.arthritis.org/</a>	This is not a very useful site to obtain information pertaining to this survey's objectives.	No	No	No	No
<i>Audubon Center in Greenwich 613 Riversville Road Greenwich, CT 06831 (203) 869-4437 <a href="mailto:Greenwich_center@audubon.org">Greenwich_center@audubon.org</a></i>	<a href="http://www.audubon.org/">http://www.audubon.org/</a>	The work of this organization surrounds issues pertaining to nature and protecting wildlife.	No	No	No	No
<i>Cancer in Cheshire: Debra Bond (chair) ddbond2@cox.net 203-271-2384</i>	<a href="http://www.cancerincheshire.com/">http://www.cancerincheshire.com/</a>	This is one of the most comprehensive of the sites on this list. There is a section on this site called "The Public Health Assessment Initiative in Cheshire", the information seems promising, particularly as they seek input from ordinary citizens on their experiences with cancer.	Yes	No	No	No

Organization Name and contact Information	Web Address	Overview	Perceived/ Prioritized Health Concern	Perceived/ Prioritized Environmental Risk	Health Database	Environment al Database
<p><i>Clean Water Action:</i>  <i>Attn: John Gurley</i>  <i>118 Oak St.</i>  <i>Hartford, CT 06106</i>  <i>860-728-1254</i>  <i>jgurley@cleanwater.org</i></p>	<p><a href="http://www.cleanwateraction.org/">http://www.cleanwateraction.org/</a></p>	<p>This site is useful because it provides information on some of the initiatives in CT to clean up not only water supplies, but also power supplies as well. An example of this is the Zero Mercury Campaign to protect children and adults from harmful exposure to mercury contamination in the drinking water.</p>	<p>Yes</p>	<p>Yes</p>	<p>No</p>	<p>No</p>
<p><i>Common Cause in CT</i>  <i>Attn: Andy Sauer</i>  <i>118 Oak Street</i>  <i>Hartford, CT 06106</i>  <i>(860) 549-1220</i>  <i>common.cause@snet.net</i></p>	<p><a href="http://www.commoncause.org/states/connecticut/">http://www.commoncause.org/states/connecticut/</a></p>	<p>Their site mainly provides information about state legislation and ethical practice in government. There is not much information on environmental issues and health. They may be a great avenue to push to have elected officials advocate for a state health tracking system.</p>	<p>No</p>	<p>No</p>	<p>No</p>	<p>No</p>
<p><i>Connecticut Association for Children with Learning Disabilities,</i>  <i>25 Van Zant Street, Unit 15-5,</i>  <i>East Norwalk, CT 06855 (203)</i>  <i>866-6108</i></p>	<p><a href="http://www.caclld.org/">http://www.caclld.org/</a></p>	<p>This site is under construction.</p>	<p>No</p>	<p>No</p>	<p>No</p>	<p>No</p>
<p><i>Connecticut Coalition for Environmental Justice</i>  <i>Mark Mitchell, MD, President</i>  <i>PO Box 1421</i>  <i>Hartford, CT 06143</i></p>	<p><a href="http://www.environmental-justice.org/">http://www.environmental-justice.org/</a></p>	<p>This site discusses a number of environmental issues such as the English Station in New Haven, and other environmental hazards.</p>	<p>No</p>	<p>Yes</p>	<p>No</p>	<p>No</p>

<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
<i>mark.mitchell@environmental-justice.org</i>						
<i>Connecticut Coalition for Environmental Justice, P.O. Box 2022, Hartford, CT 06145 (860) 54-1133 or (888) 548-1133</i>	<a href="http://www.environmental-justice.org">www.environmental-justice.org</a>	This site provides information on environmental initiatives throughout CT such as the English Station Victory.	No	No	No	No
<i>Connecticut Families for Effective Autism Treatment, CT FEAT, P.O. Box 370352, West Hartford, CT 06137 (860) 571-3888</i>	<a href="http://www.ctfeat.org">www.ctfeat.org</a>	This information contained on this website focuses exclusively on autism but not on environmental links.	Yes	No	No	No
<i>Connecticut Foundation for Environmentally Safe Schools/Canary Committee, Joellen, Larwson, <a href="mailto:Joielarwson@aol.com">Joielarwson@aol.com</a></i>	<a href="http://pollutionfreeschools.org/">http://pollutionfreeschools.org/</a>	There is information on legislative efforts to keep schools pollution free.	No	No	No	No
<i>Connecticut Fund for the Environment. 205 Whitney Avenue New Haven, CT 06511 (203) 787-0646 <a href="mailto:dstrait@cfenv.org">dstrait@cfenv.org</a></i>	<a href="http://www.cfenv.org/">http://www.cfenv.org/</a>	The information contained on this site addresses air and water quality.	No	Yes	No	No

Organization Name and contact Information	Web Address	Overview	Perceived/ Prioritized Health Concern	Perceived/ Prioritized Environmental Risk	Health Database	Environment al Database
<p><i>Connecticut Public Interest Research Group</i>  41 South Main Street  Suite 1  West Hartford, CT 06107  (860) 233-7554  connpirg@pirg.org</p>	<p><a href="http://www.connpirg.org/">http://www.connpirg.org/</a></p>	<p>There is a wealth of information on environmental hazards from cars and power plants. Their top priority seems to be the No More Mercury Campaign to prevent power plants from dumping hazardous contaminants into the environment that may harm children and childbearing women.</p>	<p>Yes</p>	<p>Yes</p>	<p>No</p>	<p>No</p>
<p><i>Council on Environmental Quality</i>  Attn: Karl Wagener  79 Elm Street  Hartford, CT 06106  (860) 424-4000  <a href="mailto:karl.wagener@po.state.ct.us">karl.wagener@po.state.ct.us</a></p>	<p><a href="http://www.whitehouse.gov/ceq">http://www.whitehouse.gov/ceq</a></p>	<p>This site seems to touch upon environmental factors and health, and includes a 45 page document “Environmental Quality in Connecticut”. There is an area on the site called “Environmental Monitor” where they describe the projects in which they are involved.</p>	<p>Yes</p>	<p>Yes</p>	<p>No</p>	<p>No</p>
<p><i>CT Association of Conservation &amp; Inland Wetland Commissions</i>  Attn: Tom O’Dell  PO Box 2373  Vernon, CT 06066-1773  (860) 399-1807 or (860)896-4731  todell@snet.net</p>	<p><a href="http://www.caciwc.org">http://www.caciwc.org</a></p>	<p>This site does not provide any information on environmental exposures and health outcomes.</p>	<p>No</p>	<p>No</p>	<p>No</p>	<p>No</p>

<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
<i>CT League of Conservation Voters Attn: Julia Belaga, Russell Brenneman, Co-Chairs 118 Oak Street Hartford, CT 06106 (860)524-1194 <a href="mailto:ctlcv@mindspring.com">ctlcv@mindspring.com</a></i>	<a href="http://www.ctlcv.org">http://www.ctlcv.org</a>	This site seems to be mainly focused around getting elected officials to take responsibility for their actions surrounding environmental decisions/position.	No	No	No	No
<i>CTVIA P.O. Box 161, Manchester, CT 06045</i>	<a href="http://www.ctvia.org">www.ctvia.org</a>	This website provides information on vaccination. There is a section specifically dedicated to smallpox	No	No	No	No
<i>Ecological Health Organization, Inc (ECHO), P.O. Box 0119, Hebron, CT 06248 (860 ) 228-2693</i>	<a href="http://www.echomcsct.homestead.com">www.echomcsct.homestead.com</a>	This website provides information on advocacy, support, education and referral of people who suffer from multiple chemical sensitivity	No	No	No	No
<i>Environment &amp; Human Health, Inc. Attn: Nancy Alderman (203)248-6582 <a href="mailto:nancy.alderman@yale.edu">nancy.alderman@yale.edu</a></i>	<a href="http://www.ehhi.org/">http://www.ehhi.org/</a>	The site contains information ranging from diesel exhaust and children to pressure treated wood.	Yes	Yes	No	No
<i>Greater Hartford LICC, HARC Stepping Stones, 900 Asylum Ave, Hartford, CT 06105 (860) 278- 4272</i>	<a href="http://www.licchartford.org">www.licchartford.org</a>	The site is dedicated to directing parents to state and local systems that service children	No	No	No	No
<i>Gulf War Illness Advisory Council</i>	N/A	There was no website for this organization.	N/A	N/A	N/A	N/A

<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
<i>Hispanic Health Council Maria Martinez 175 Main Street Hartford, CT 06106 Phone 527-0856 mariam@hispanichealth.com</i>	<a href="http://www.hispanichealth.com/">http://www.hispanichealth.com/</a>	This site identifies health concerns affecting the Latino/Hispanic population. There is no mention of environmental factors, pathogens or toxins that are related to these identified health concerns. The main health focus of the Hispanic Health Center seems to be HIV/AIDS	Yes	No	No	No
<i>Institute for Community Research Attn: Jean Schensul, PhD 2 Hartford Square West Hartford, CT 06106 (860)278-2044 Fax: (860) 278-2141 jschensu@aol.com</i>	<a href="http://www.incommunityresearch.org/">http://www.incommunityresearch.org/</a>	A lot of their basic research is around HIV/AIDS and mental health. There is not much information on environmental exposure and health.	No	No	No	No
<i>Juvenile Diabetes Association, 18 North Main Street, 3rd Floor, West Hartford, CT 06107 (860) 561-3440</i>	<a href="http://www.jdrf.org">www.jdrf.org</a>	This site provides information on living with the disease, and legislative action surrounding diabetes.	No	No	No	No
<i>Learning Disabilities Association of Connecticut, 999 Asylum Ave, 5th Floor, Hartford, CT 06105 (860) 560-1711</i>	<a href="http://www.ldact.org">www.ldact.org</a>	This organization mainly provides services for families with children who suffer from a learning disability.	No	No	No	No
<i>Lyme Disease Foundation One Financial Plaza Attn: Thomas Forscher Hartford, CT 06103 (860) 525-2000 lymefnd@aol.com</i>	<a href="http://www.lyme.org/">http://www.lyme.org/</a>	This site is useful in providing information on documented cases of Lyme disease, there aren't many links that take you to the information. The site describes research that they conduct on tick-borne	Yes	Yes	No	No

<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
		diseases.				
<i>March of Dimes Birth Defects Foundation, CT Chapter Attn: Louise Sheehan 135 Founders Plaza East Hartford, CT 06108 (860) 290-5440 lsheehan@marchofdimes.com</i>	<a href="http://www.modimes.org/">http://www.modimes.org/</a>	The information on this site is mainly focus on advocacy and campaigning. They do provide peri-natal, fertility and other statistics. This site may be of some use if you are looking for data on the prevalence of various birth defects nationally as well as in CT.	Yes	No	No	No
<i>National Kidney Foundation 920 Farmington Ave West Hartford, CT 06107 (860) 232-6054 khathaway@kidneyct.org</i>	<a href="http://www.kidneyct.org/">http://www.kidneyct.org/</a>	The majority of the information on this site is focused around kidney transplants etc.	Yes	No	No	No
<i>Natural Resources Council of CT PO Box 72 Danbury, CT 06813 (203) 743-0306 cbennitt@rwater.com</i>	N/A	There is no website available for CT but there is a website for the Maine chapter. The site only provides general information about health outcomes and environmental risk, nothing extensive.	Yes	Yes	No	No
<i>PACE- People's Action for Clean Energy Attention: Judi Friedman 101 Lawton Road Canton, CT 06019-2209 (860) 693-4813</i>	<a href="http://www.pace-cleanenergy.org">http://www.pace-cleanenergy.org</a>	This site is on issues of nuclear power and health outcomes. There are links to articles that discuss radiation exposure and public health.	No	Yes	No	No

Organization Name and contact Information	Web Address	Overview	Perceived/ Prioritized Health Concern	Perceived/ Prioritized Environmental Risk	Health Database	Environment al Database
<i>FAX: 860-693-2822</i>						
<i>Sickle Cell Anemia Association, Hartford Regional Office, Gengras Ambulatory Center, Suite 2101, 114 Woodland Street, Hartford, CT 06105 (860) 527-0119</i>	<a href="http://www.sicklecellct.org">www.sicklecellct.org</a>	There has never been any substantial research into the number of people in Ct with sickle cell. Tracking of the number of people born with the disease is kept at the CT Department of Public Health but the actual association does not have information on the number of people affected by sickle cell in the state.	Yes	No	No	No
<i>Sierra Club – CT Chapter Attn: Steven Colangelo 118 Oak Street Hartford, CT 06106 (860) 525-2500 ctsierraclub@aol.com</i>	<a href="http://www.sierraclub.org">http://www.sierraclub.org</a>	This website had information on the Sierra Club and some of their efforts, such as legislative efforts surrounding energy conservation and economic development aid, but contains little information about a tracking system or health outcomes related to environmental issues.	No	No	No	No
<i>South Central CT Regional Water Authority Tom Chaplik, Vice President of Water Quality (203) 401 2725 tchaplik@rwater.com.</i>	<a href="http://www.rwater.com/">http://www.rwater.com/</a>	This site provides information on the water quality in CT.	No	Yes	No	No

<b>Organization Name and contact Information</b>	<b>Web Address</b>	<b>Overview</b>	<b>Perceived/ Prioritized Health Concern</b>	<b>Perceived/ Prioritized Environmental Risk</b>	<b>Health Database</b>	<b>Environment al Database</b>
<i>The Connecticut CFIDS &amp; FM Association, Inc. P.O. Box 3010, Milford, CT 06460 (800) 952-2307</i>	<a href="http://www.ct-cfids-fm.org/">www.ct-cfids-fm.org/</a>	This site provides general information on Chronic Fatigue Immune Dysfunction Syndrome. There is no mention of a database or prioritization of disease or environmental hazards.	No	No	No	No
<i>The Nature Conservancy – CT Chapter, Attn: Melinda Brayton 55 High Street Middletown, CT 06457 (860) 344-0716 mbrayton@tnc.org</i>	<a href="http://nature.org/wherework/northamerica/states/connecticut/">http://nature.org/wherework/northamerica/states/connecticut/</a>	This organization’s work is mainly around environmental protection, i.e. protecting the states water and forests. There is no mention of perceived health concerns related to this effort.	No	No	No	No
<i>Toxics Action Center, Kristen Burns, Field Coordinator, (860) 233-7623</i>	<a href="http://www.toxicsaction.org">www.toxicsaction.org</a>	The information contained on this site is focused on the work that the organization has done to help clean up toxic pollution such as pesticides and hazardous waste sites in various communities across the state. In Connecticut their main focus appears to be air quality.	No	Yes	No	No
<i>Trust for America’s Health</i>	<a href="http://www.healthyamericans.org">www.healthyamericans.org</a>	Information about various public health concerns (birth defects, surveillance issues), can be broken down by state.	No	No	Yes	No

Organization Name and contact Information	Web Address	Overview	Perceived/ Prioritized Health Concern	Perceived/ Prioritized Environmental Risk	Health Database	Environment al Database
<i>Women's Cancer Center</i>	<a href="http://www.wccenter.com">www.wccenter.com</a>	The site provides general information on the various types of cancers, prevention, awareness and detection information as well as legislative efforts.	Yes	No	No	No



# Appendix 9

## *Secondary Source Review*

*This review of secondary sources – collected for other purposes – was conducted to shed light on the health and environmental concerns of CT residents. For inclusion in this analysis, the surveys had to meet one or more of the following criteria: 1) surveys had to somehow inform the issue of environmental public health tracking; 2) surveys had to be recent (2000); and 3) surveys had to have CT specific results.*



<b>Title:</b> 2003 Environmental Survey	<b>Date:</b> March, 2003
<b>Organization:</b> League of Conservation Voters	<b>Implemented by:</b> Impact Strategies
<b>Contact:</b> Ms. Laurie Brown – Executive Director, Connecticut Chapter, <a href="http://www.conservationeducation.org">www.conservationeducation.org</a>	
<b>Methodology:</b> The CTLCV Education Fund Survey was conducted with 501 likely CT voters, using a random digit dialing methodology. A quota system was used to ensure appropriate regional, party, and gender representation of the final sample. The margin of sample error associated with a survey of this size is +/- 5 percentage points at the 95 <sup>th</sup> confidence level.	
<p><b>Purpose:</b> Since 2000, CTLCV Education Fund has commissioned an annual poll of the CT electorate to research citizen behavior and responsiveness to environmental issues. The poll is conducted to provide three types of information:</p> <ul style="list-style-type: none"> <li>• One set of questions gathers baseline data on environmental attitudes in CT that can be compared from year to year to gauge trends.</li> <li>• The second set of questions is different every year based on input from environmental groups and current events in CT</li> <li>• The third set of question test specific messages and voter responsiveness</li> </ul> <p>In 2003, a number of questions were added to the poll to reflect current environmental initiatives in CT.</p>	

<b>Title:</b> Environment 2000: Citizen's Response Summary	<b>Date:</b> October, 1986																			
<b>Organization:</b> CT Department of Environmental Protection	<b>Implemented by:</b> CT DEP																			
<b>Contact:</b> Ms. Tess Gutowski, CTDEP Bureau of Water Management																				
<b>Methodology:</b> Approximately 15,000 texts and forms were distributed and 314 completed forms returned.																				
<p><b>Purpose:</b> To solicit public response to Environment/2000: Connecticut's environmental goals and management strategies.</p> <ul style="list-style-type: none"> <li>• Preservation</li> <li>• Pollution Control</li> <li>• Resource Management</li> <li>• Services</li> </ul>																				
<p><b>Relevant Findings:</b> Gives percentages of priority responses and rank for all issues (based on 314 responses and 37 issues)</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 15%; text-align: center;">% High Priority</th> <th style="width: 15%; text-align: center;">Rank</th> </tr> </thead> <tbody> <tr> <td>Surface and Ground Water Quality</td> <td style="text-align: center;">80</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Hazardous Waste</td> <td style="text-align: center;">75</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Drinking water Supply</td> <td style="text-align: center;">75</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Toxic Water Pollutants</td> <td style="text-align: center;">74</td> <td style="text-align: center;">4</td> </tr> <tr> <td>Tidal Wetlands</td> <td style="text-align: center;">69</td> <td style="text-align: center;">5</td> </tr> </tbody> </table>				% High Priority	Rank	Surface and Ground Water Quality	80	1	Hazardous Waste	75	2	Drinking water Supply	75	2	Toxic Water Pollutants	74	4	Tidal Wetlands	69	5
	% High Priority	Rank																		
Surface and Ground Water Quality	80	1																		
Hazardous Waste	75	2																		
Drinking water Supply	75	2																		
Toxic Water Pollutants	74	4																		
Tidal Wetlands	69	5																		
<p>Although this survey was conducted some time ago, it is an excellent example of opinion validation and is therefore included as a reference.</p>																				

<b>Title:</b> Recommended Conservation and Development Policies Plan for CT 2004 - 2009	<b>Date:</b> March, 2004
<b>Organization:</b> Office of Policy and Management	<b>Implemented by:</b>
<b>Findings:</b>  <b>Growth Management Principle # 5 (5 of 6)</b> Protect and Ensure the Integrity of Environmental Assets Critical to Public Health and Safety <ul style="list-style-type: none"> <li>• Drinking Water Supplies</li> <li>• Water Quality</li> <li>• Air Quality</li> <li>• Waste Management: Solid, Hazardous, and Low-Level Radioactive</li> </ul>	

<b>Title:</b> The 2002 Annual Report on Environmental Quality in CT	<b>Date:</b> May, 2003
<b>Organization:</b> CT Council on Environmental Quality	<b>Implemented by:</b> CT CEQ
<b>Methods:</b> A nine-member board that works independent of CT DEP to: <ul style="list-style-type: none"> <li>• Submit to the Governor' Office an annual report on status of CT's environment, including progress towards "Environment 2002", with recommendations for addressing deficiencies of state programs.</li> <li>• Review State agencies' construction projects.</li> <li>• Investigate citizens' complaints and allegations of violations of environmental laws.</li> </ul>	
<b>Findings:</b> A total of 28 different indicators are presented, many of which track public health trends, for example:  Number of new cases of Breast Cancer per year per 100,000 CT residents, tracked since 1935. Number of new cases of Non-Hodgkin's Lymphoma per year per 100,000 CT residents, tracked since 1935. Carbon Dioxide Emissions per CT resident, tracked since 1990.	

<b>Title:</b> National Health and Nutrition Examination Survey III	<b>Date:</b> On-Going
<b>Organization:</b> Centers for Disease Control and Prevention National Center for Health Statistics	<b>Implemented by:</b> Contracted to Westat
<b>History and Methodology:</b>	
<p>NHANES is a series of surveys designed to collect data on the health and nutritional status of the US population. Data are collected by interview, physical examination, as well as a number of clinical measurements and tests from all members of the sample.</p> <p>NHANES I                    1971 – 1975  NHANES II                    1976 – 1980  NHANES III                    1988 – 1994</p> <p>N = 40,000 people selected from households in 81 counties across the US. African-Americans and Mexicans comprised 30% of the sample. NHANES III also placed additional emphasis on the effects of the environment upon health.</p> <p>The major differences from previous NHANES are that the current NHANES will be a continuous annual survey. Westat has been contracted to conduct the study for approximately 6 years and data collection began early in 1999 and The number of people examined in a 12 month period will be about the same as in previous NHANES, about 7,000 people per year in 15 locations.</p> <p><b>Purpose:</b> the overall goals of data collection are as follows:</p> <ul style="list-style-type: none"> <li>• Estimate the number and percentage of persons in the US pop and designated subgroups with selected diseases and risk factors</li> <li>• Monitor trends in the prevalence, awareness, treatment, and control of selected diseases.</li> <li>• Monitor trends in risk behaviors and environmental exposures</li> <li>• Analyze risk factors for selected diseases</li> <li>• Study the relationships between diet a, nutrition, and health.</li> <li>• Explore emerging public health issues and new technologies.</li> </ul>	

<b>Title:</b> The National Report on Human Exposure to Environmental Chemicals	<b>Date:</b> On-Going
<b>Organization:</b> Centers for Disease Control and Prevention - National Center for Health Statistics	
<b>Methodology:</b> Analysis of data from NHANES	
<p><b>Purpose:</b> provides an ongoing assessment of the U.S. population's exposure to environmental chemicals using bio-monitoring.</p> <p>The first National Report on Human Exposure to Environmental Chemicals (First Report) was issued in March 2001. This Second Report, released in January 2003, presents bio - monitoring exposure data for 116 environmental chemicals for the non- institutionalized, civilian U.S. population over the 2-year period 1999-2000. The first Report presented exposure data for 27 chemicals from NHANES 1999; this Second Report presents exposure data for 116 chemicals (including the 27 in the first Report) from NHANES 1999-2000. The Second Report also presents exposure data for the U.S. population divided into age, gender, and race/ethnicity groups. The first Report measured lead, mercury, cadmium, and other metals; dialkyl phosphate metabolites of organo-phosphate pesticides; cotinine; and phthalates. The Second Report includes these chemicals and adds: Polycyclic aromatic hydrocarbons (PAHs), Dioxins, furans, and coplanar polychlorinated biphenyls (PCBs), Non-coplanar PCBs, Phytoestrogens, Selected organophosphate pesticides, Organochlorine pesticides, Carbamate pesticides, Herbicides, Pest repellents and disinfectants.</p>	
<b>Findings:</b> Given the way this report is organized it is difficult to come up with priorities as such, however, all those chemicals studied were in some way prioritized by CDC and hence are listed below:	
Lead, mercury, cadmium, and other metals; dialkyl phosphate metabolites of organo-phosphate pesticides; cotinine; and phthalates	Polycyclic aromatic hydrocarbons (PAHs), Dioxins, furans, and coplanar polychlorinated biphenyls (PCBs), Non-coplanar PCBs, Phytoestrogens, Selected organophosphate pesticides, Organochlorine pesticides, Carbamate pesticides, Herbicides, Pest repellents and disinfectants.

<b>Title:</b> Zero Mercury Fish Campaign	<b>Date:</b> August, 2003
<b>Organization:</b> Clean Water Action	
<b>Methodology:</b> Across the six states, 1400 New Englanders were asked three questions about their knowledge of government advisories regarding mercury contamination of fish.	
<b>Purpose:</b> To assess level of knowledge among New England Residents about government advisories to limit eating certain fish due to mercury.	
<b>Findings:</b> Over one-third (36%) of those surveyed were unaware that there were advisories. Forty-six percent (46%) were unaware that women of childbearing age and young children should not eat swordfish, tuna steak, and many freshwater fish in New England because of mercury contamination. Fifty-nine percent (59%) were unaware that pregnant women and young children should limit consumption of canned tuna. Of the 1,400 people surveyed across New England by the Zero Mercury Campaign, 169 of those were in front of Connecticut stores in Hartford and New Haven. The Connecticut results showed that half of those surveyed were totally unaware of the warnings (50%), that 58% were unaware of the swordfish and tuna steak warning, and that the vast majority, 72% were unaware of warnings about canned tuna.	

# Appendix 10:

## *Database Inventory Tool*

*This database inventory tool was adapted from one designed by another state and used to collect information about existing databases in CT.*



**Part A – General Information**

**Background:** the *Pew Environmental Health Commission* documented the need for a national environmental public health tracking surveillance network in its January 2001 report "America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network." The "gap" that this report describes is the lack of basic information that could document possible links between environmental pollutants, chronic diseases, and other diseases. The *Pew* report also underscores the need for a strong tracking infrastructure that can rapidly detect and respond to disease outbreaks associated with terrorist acts. Thank you for participating in this Survey. To learn more about Environmental Public Health Tracking , visit: <http://www.cdc.gov/nceh/tracking/>.

Date: \_\_\_\_\_

Interviewer (if present): \_\_\_\_\_  
(provide name)

Name of Interviewee: \_\_\_\_\_  
(provide name)

Interviewee contact information: \_\_\_\_\_  
(phone number) (fax number) (email address)

Database Owner Name: \_\_\_\_\_  
(Department/Division/Unit)

Physical location database: \_\_\_\_\_  
(address/building/floor)

Database Manager: \_\_\_\_\_  
(provide name)

Manager Contact Information: \_\_\_\_\_  
(phone number) (fax number) (email address)

Name of Database: \_\_\_\_\_

What is this database used for?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Part C – Data Source**

1. What is the source of the data in the database?

- Birth Registry
- Death Registry
- Tumor registry
- Medical Provider records (*check specific type of provider record*)
  - \_\_\_\_\_ Hospital Discharge
  - \_\_\_\_\_ Hospital Outpatient
  - \_\_\_\_\_ Emergency Department
  - \_\_\_\_\_ Referral/Specialty
  - \_\_\_\_\_ Private Practitioner
  - \_\_\_\_\_ Primary Care
  - \_\_\_\_\_ Other Specify: \_\_\_\_\_
- School Health Records
  - \_\_\_\_\_ School Nurse
  - \_\_\_\_\_ School Based Clinic
  - \_\_\_\_\_ Other Specify: \_\_\_\_\_
- Healthcare Payer Records
  - \_\_\_\_\_ Medicare
  - \_\_\_\_\_ Medicaid
  - \_\_\_\_\_ Private Insurance/HMO
  - \_\_\_\_\_ Other Specify: \_\_\_\_\_
- Pharmacy Records
- Population Survey
  - Self Report? (e.g. BRFSS) \_\_\_\_\_ Yes \_\_\_\_\_ No
  - Verified with Medical Records? \_\_\_\_\_ Yes \_\_\_\_\_ No
- Laboratory Reports Specify type of sample: \_\_\_\_\_  
 Is this a notifiable disease? If yes, specify: \_\_\_\_\_
- Facility Reports (e.g. permitting)
- Agency Inspections/Reports
  - \_\_\_\_\_ Compliance
  - \_\_\_\_\_ Complaint
  - \_\_\_\_\_ Other Specify: \_\_\_\_\_
- Environmental Monitoring Specify: \_\_\_\_\_
  - \_\_\_\_\_ Fixed monitor Specify: \_\_\_\_\_
  - \_\_\_\_\_ Mobile monitor Specify: \_\_\_\_\_
  - \_\_\_\_\_ Special study Specify: \_\_\_\_\_
- Other data source Specify: \_\_\_\_\_  
 \_\_\_\_\_

**Part D – Timeframe, Method/Mode of Collection & Reporting to the Database**

1. What is the current method/mode of data reporting/entry ? (check all that apply)

Electronic submission (check all that apply)

\_\_\_\_ Data file on media (e.g. diskette, CDROM, zip disk, zip drive, portable hard drive)

\_\_\_\_ Data streaming (e.g. real time sensor data)

\_\_\_\_ FTP

\_\_\_\_ Network (local)

\_\_\_\_ Wide Area Network (i.e. Internet)

\_\_\_\_ Electronic laboratory reporting

\_\_\_\_ Active download from website

\_\_\_\_ Email attachment Specify type of attachment: \_\_\_\_\_

(e.g. document, encrypted file, pdf, spreadsheet, textfile)

\_\_\_\_ Other Specify: \_\_\_\_\_

Hard copy (mail or fax)

2. Is the data reporting voluntary or required?

Voluntary

Required Specify regulatory requirement: \_\_\_\_\_

3. Is the data actively collected or passively received?

Actively collected (e.g. program auditing of medical records, program collection of samples)

Briefly describe mechanism: \_\_\_\_\_

Passively received

4. What is the initial month and year of data collection? Month/Year (mmyyyy): \_\_\_\_\_

5. Is this data currently collected?

No Date data collection stopped: \_\_\_\_\_

Yes

6. How many records are reported annually? \_\_\_\_\_

If unknown, what is the total number of records in the database? \_\_\_\_\_

7. How is the data processed? (check all that apply)

Manual data entry

Data transformed (e.g. data recoded or reformatted)

Automated updating of new records

Other Specify: \_\_\_\_\_

8. Was chain of custody procedure required for the sample?

Yes Is chain of custody documented in the database? \_\_\_\_ Yes \_\_\_\_ No

No

**Part E - Significant Changes in Data Collection**

1. Have there been any significant interruptions in data collection since the initial month/year of collection?

No

Yes Date start interruption: \_\_\_\_\_ Date end interruption: \_\_\_\_\_

2. Have there been any other significant changes in data collection? *(complete all that apply)*

No changes

Changes in method/mode of data collection

Date of change: \_\_\_\_\_ Describe briefly: \_\_\_\_\_

Addition/Deletion of variables collected

Date of change: \_\_\_\_\_ Describe briefly: \_\_\_\_\_

Coding Changes *(e.g. classification of items, changes in case definition)*

Date of change: \_\_\_\_\_ Describe briefly: \_\_\_\_\_

Changes in inclusion criteria

Date of change: \_\_\_\_\_ Describe briefly: \_\_\_\_\_

Other change

Date of change: \_\_\_\_\_ Describe briefly: \_\_\_\_\_

Part F – Timeliness

1. How often is the data collected?

- Near real time
- Hourly
- Daily
- Weekly
- Monthly
- Other

Describe briefly: \_\_\_\_\_

2. What is the average/typical time lag between when the **data is collected** and when the **data is reported to/entered into the data system**? (indicate time period where applicable, e.g. 3 hours, 2 months)

- \_\_\_\_\_ Near real time
- \_\_\_\_\_ Hours
- \_\_\_\_\_ Days
- \_\_\_\_\_ Weeks
- \_\_\_\_\_ Months
- \_\_\_\_\_ Other

Describe briefly: \_\_\_\_\_

3. What is the average/typical time lag between when the **data is reported to/entered into the data system** and when the **data is available for internal staff use**? (indicate time period where applicable, e.g. 3 hours, 2 months)

- \_\_\_\_\_ Near real time
- \_\_\_\_\_ Hours
- \_\_\_\_\_ Days
- \_\_\_\_\_ Weeks
- \_\_\_\_\_ Months
- \_\_\_\_\_ Other

Describe briefly: \_\_\_\_\_

4. What is the average/typical time lag between when the **data is reported to/entered into the data system** and when the **data is available for external use/public release**? (indicate time period where applicable)

- \_\_\_\_\_ Near real time
- \_\_\_\_\_ Hours
- \_\_\_\_\_ Days
- \_\_\_\_\_ Weeks
- \_\_\_\_\_ Months
- \_\_\_\_\_ Other

Describe briefly: \_\_\_\_\_

**Part G – Types of Data Elements**

1. What personal identifiers are collected? *(check all that apply)*

- Name of patient/client
- Social Security Number
- State File Number
- Medicaid ID
- Other Specify: \_\_\_\_\_

2. What type of demographic data is collected? *(check all that apply)*

- Age
- Race
- Ethnicity
- Gender
- Other Specify: \_\_\_\_\_

3. Is disease diagnosis collected?

- No
- Yes Obtained from which source?
  - \_\_\_ Physician's Reportable Disease Confidential Case Report (PD-23)
  - \_\_\_ Self-report
  - \_\_\_ Laboratory Report

4. What are the date and time measurements collected? *(check all that apply)*

	<u>Date collected</u>	<u>Time collected</u>
<input type="checkbox"/> Disease onset	Yes _____	Yes _____
<input type="checkbox"/> Sample collection	Yes _____	Yes _____
<input type="checkbox"/> Sample received at laboratory	Yes _____	Yes _____
<input type="checkbox"/> Sample analysis performed	Yes _____	Yes _____
<input type="checkbox"/> Sample results reported to program/agency	Yes _____	Yes _____
<input type="checkbox"/> Other	Specify: _____	

5. What site/facility identifiers are collected? *(check all that apply)*

- Not applicable
- Permit number
- State ID
- Federal ID
- Dun & Bradstreet
- SIC/NAIC code
- Other Specify: \_\_\_\_\_

**Part G – Types of Data Elements (Continued)**

6. What geographic identifiers are included in the database? *(check all that apply)*

Coordinates, obtained by:

\_\_\_ Geocoding

\_\_\_ GPS

\_\_\_ Screen Digitized

\_\_\_ Other

Specify: \_\_\_\_\_

Address *(check all that apply)*

\_\_\_ Street number

\_\_\_ Street name

\_\_\_ Intersection(Cross Street Name)

\_\_\_ Town

Are boroughs/villages collected? \_\_\_ Yes \_\_\_ No

\_\_\_ State

\_\_\_ Zip Code

Is zip+4 collected? \_\_\_ Yes \_\_\_ No

\_\_\_ County

\_\_\_ Census tract

\_\_\_ Census block group

\_\_\_ Census block

\_\_\_ Other

Specify: \_\_\_\_\_

Water body/hydrologic unit

Specify type: \_\_\_\_\_

Basin/Watershed

River/Stream

Transportation Corridor

Other geographic identifier

Specify: \_\_\_\_\_

7. What other identifiers are included? *(check all that apply)*

Concentration level, obtained through:

\_\_\_ sampling

\_\_\_ monitoring

\_\_\_ calculation

\_\_\_ modeling

Chemical Type

Emission Rate/Discharge Rate

Environmental Media Type

Compliance Status

Source of Emission/Discharge/Release *(check all that apply)*

\_\_\_ Stationary

\_\_\_ Mobile

\_\_\_ Area

\_\_\_ Non-Point

\_\_\_ Point

\_\_\_ Biogenic

\_\_\_ Fugitive

\_\_\_ Stack

\_\_\_ Other, Specify \_\_\_\_\_

**Part H – Use of data**

What are the data used for presently? *(check all that apply)*

- Public health
- Environmental Risk Assessment
- Human Health Risk Assessment
- Hazardous Waste Site Characterization
- Environmental actions including enforcement
- Program Planning
- Program Evaluation
- Public Education
- Monitoring trends
- Compliance monitoring
- Regulation development
- Hazard identification *(e.g. alerts, spills, etc.)* Specify \_\_\_\_\_
- Decision Support
- Other Specify \_\_\_\_\_

What are planned future uses of the data? *(check all that apply)*

- Public health
- Environmental Risk Assessment
- Human Health Risk Assessment
- Hazardous Waste Site Characterization
- Environmental including enforcement
- Program Planning
- Program Evaluation
- Public Education
- Monitoring trends
- Compliance monitoring
- Regulation development
- Hazard identification *(e.g. alerts, spills, etc.)* Specify \_\_\_\_\_
- Decision Support
- Other Specify \_\_\_\_\_

3. What level of government uses the data? *(check all that apply)*

- Local If only used by local, check here \_\_\_\_\_
- State If only used by state, check here \_\_\_\_\_
- Federal If only used by federal check here \_\_\_\_\_
- Regional If only used by regional check here \_\_\_\_\_
- Other Specify \_\_\_\_\_

**Part I – Legal Authorities/ Access to Data**

1. Which statutes/regulations provide legal authority to collect the data?

\_\_\_\_\_

2. Which statutes/regulations provide legal authority to share the data?

\_\_\_\_\_

3. Briefly describe the policy/process for sharing data

Policy/Process: \_\_\_\_\_

4. Who should be contacted to obtain data from the database?

Name: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Email: \_\_\_\_\_

5. Describe data sets/data reports currently available for public access

\_\_\_\_\_

6. Are the datasets/data reports identified in item 5 available through *(check all that apply)*:

Hard copy

Electronic media

Web based Specify internet address: \_\_\_\_\_

7. Is a data dictionary available?

No

Yes In what format is the data dictionary available? *(check all that apply)*

\_\_\_ Hard copy (please provide copy with completed survey)

\_\_\_ Electronic media

\_\_\_ Web based Specify internet address: \_\_\_\_\_

8. Does a fact sheet or meta data document exist for this data set?

No

Yes In what format is the meta data available? *(check all that apply)*

\_\_\_ Hard copy (please provide copy with completed survey)

\_\_\_ Electronic media

\_\_\_ Web based Specify internet address: \_\_\_\_\_

**Part J – IT structure/architecture**

Technical Contact:

\_\_\_\_\_ (provide name)

Technical Contact Information:

\_\_\_\_\_ (phone number)

\_\_\_\_\_ (fax number)

\_\_\_\_\_ (email address)

1. How are the data stored?

- Hard drive
- CD-Rom
- Data storage provider
- Network Facility
- Other

Specify \_\_\_\_\_

2. What computer platform is used to host the database?

- Personal Computer (Intel x86 / AMD)
- IBM Mainframe
- Sun Microsystems
- Macintosh
- Sparc
- Silicon Graphic
- Other

Specify \_\_\_\_\_

3. What operating system is used to host the database?

- Unix
- Macintosh
- Microsoft (*i.e. NT, 2000, XP*)
- Microsoft Server (*i.e. NT, 2000, 2003*)
- Linux
- Other

Specify \_\_\_\_\_

Part J – IT structure/architecture (continued)

4. What format or database server does the database adhere to?

- Flat File
- DB2
- MS Excel
- MS SQL
- SAS / SPSS / STATA
- Fox Pro
- Paradox
- MS Access
- Oracle
- Other Specify \_\_\_\_\_

5. What format is Geospatial (GIS) stored in?

- Shapefile
- Coverage
- Personal Geodatabase
- Multiuser Geodatabase Specify DBMS: \_\_\_\_\_
- Other Specify: \_\_\_\_\_

6. How are data within the database typically accessed?

- Web-based Internet
- Web-based intranet
- Client-Server Application
- Terminal to main frame (i.e. ADM)
- Application
- Manual
- Other Specify \_\_\_\_\_

7. Is the dataset stored using a Nationally recognized standard(s)? (i.e. HL-7, HIPAA, EDSC, EDI)

- No
- Yes Specify \_\_\_\_\_





# Appendix 11

## *Database Inventory Summary*

*The Inventory Summary reflects the findings of the database review analysis*



## Summary of Database Committee Inventory Findings: Health Topics

Topic	Database Findings
Birth Defects/ Adverse Birth Outcomes	<p>The CT Birth Defects Registry is a primary source of birth defects/adverse birth outcomes in CT. The registry actively collects data through the newborn screening program and contains approximately 200 records (annual reporting unknown) since its inception in October 2002. The registry includes the following demographic information obtained from medical records: patient name, birth mother's name and date of birth, address, state file number, race, ethnicity, gender, and date of birth (see Database File Layout pgs 17 – 19 of inventory for detailed database contents). Aggregate data is available when generated; internal data requests written request to database manager (no patient identifiers); external requests IRB/HIC request (no patient identifiers).</p> <p>The CT Vital Records Birth Registry is another source of data for adverse birth outcomes in CT including premature birth and low birth weight. The registry is population-based includes all reported births to CT Residents occurring within CT or out of state as mandated by law. The registry dates back to the mid 1850's. Birth data from 1959 to present is currently available in electronic format. Approximately 44,000 + births occur annually. Demographic data includes: child's name, age, sex, date of birth, race, ethnicity, birth weight, and demographic information about the parents. Geographic identifiers include residence, street name, town, zip code and county. Data concerning the pregnancy history, obstetric procedures, complications of birth, medical and other risk factors, and abnormal conditions of the newborns are also collected. Data access requires a written request for HIC/IRB approval.</p>
Cancer	<p>While there are multiple datasets that include information on cancer (the Death Registry, OHCA Hospital Inpatient Discharge Database, CHIME), the single most comprehensive source of information on cancer is the CT Tumor Registry. The registry is population-based and includes all reported cancers diagnosed among CT residents from 1935 to the present, as well as follow-up, treatment and survival data. All hospitals and private laboratories in CT are required by law to report cancer cases to the registry; this includes hospital discharges, outpatient services, emergency department treatments, referral/specialty care and clinical laboratory results including benign conditions. Approximately 21,000 cases are reported annually and the database currently includes approximately 475,000 cases.</p>

Topic	Database Findings
<p>Cardiovascular Diseases/ Heart Attack</p>	<p>There are at least three sources of data for cardiovascular diseases: the BRFSS (Behavioral Risk Factor Surveillance Survey), the Office of Health Care Access (OHCA) hospital discharge database, and the CT Hospital Association's CHIME data.</p> <p>The National Registry of Myocardial Infarction and American College of Cardiology also have databases that focus on AMI as a topic.</p> <p>The BRFSS is a randomized telephone survey which includes self-reported measures of the prevalence of cardiovascular disease. Demographic data include age, race, gender, ethnicity and town of residence. Data is available by hard copy, electronically and via the web.</p> <p>OHCA's hospital discharge database includes demographic and clinical information for patients who were admitted to the hospital. Demographic data includes age, race, ethnicity, gender, birth weight and date of birth). Geographic identifiers included are town, state, zip code, and county. Clinical information includes the principal and secondary discharge diagnoses.</p> <p>The CT Hospital Association's CHIME data includes information on hospital inpatients, as well as (hospital-based) ambulatory surgery departments and emergency departments. Clinical information include primary and secondary diagnoses (collected from hospital discharge or emergency discharge), procedures, DRG (for some Medicare pts), and disposition. (Patient information also includes demographic variables (race, ethnicity, gender and birth date), geographic identifiers street name, town, zip code, boroughs/villages), financial and provider information. Policy on data sharing: governance and oversight structure under board establishes what can disclose, disclosure of doctor and hospital identifiers requires each hospital's permission; patient identifiers (including birth date) not geographic identifiers (including zip code) may not be released. Internet or written request for data submitted to CHIME available for sharing data. Data sets/data reports not available for public access.</p>

Topic	Database Findings
Lead Poisoning	<p>In CT laboratories are required to report to the CT DPH all patient's blood level test results regardless of age of blood lead level. The primary database for childhood lead poisoning in CT is housed at the Childhood Lead Poisoning Prevention Program (CLPPP). This database creates a "case" for each child that is reported; a case then includes lab test results, demographic information, and associated property information such as home inspections and lead abatement. The CLPPP surveillance database has been designed to import data from other sources, including Birth Registry data and Medicaid data. The CLPPP database is planned to become part of the CEDSS system in the future which will further facilitate electronic laboratory reporting and importing data from other sources.</p> <p>The Adult Blood Lead Epidemiology and Surveillance Unit tracks surveillance data of adults with elevated blood lead levels, including exposure (occupational) information. This data is housed in the CLPPP data system.</p> <p>CYSHCN - Children and Youth with Special Health Needs Center Data provides data specifically for Yale Center for Children with Special Health Care Needs of Connecticut Children's Medical Hospital. Individual data includes demographic, diagnostic and family survey data.</p>
Carbon Monoxide Poisoning (CO)	<p>There are two sources of carbon monoxide poisoning data: the Carbon Monoxide Poisoning database and the CT Poison Control Center. Carbon monoxide poisoning is reportable by law. Laboratories are required to report incidents in which a patient's carboxyhemoglobin level meets or exceeds 9% to the CT DPH and cases are entered into the Carbon Monoxide Poisoning database. Initiated in October of 1997, approximately 50 cases are reported annually. This database collects: name, age, race, ethnicity, gender, date of birth, address and occupation. The database is used to assess level of CO concentration and use of CO detectors. The data is available to the public via a written request to the principal investigator; no patient identifiers are provided.</p> <p>Carbon monoxide poisoning information may also be found within the CT Poison Control Center (CPCC)'s database Toxicall®. Toxicall generates data as individual patient phone calls are received. The data include patient demographics, exposures, and medical histories (underlying medical conditions, past prescription and over-the-counter drug use and general health). In addition, the database contains hospital poisoning admissions as all CT hospitals are required by law to report to the Poison Information Center each incident of a treated accidental poisoning. The database includes the following: patient name, gender, age, zip code (occasional address) and the name of the recorder. Possible limitation is that data... "may be coded somewhat variably by the poison specialists who are entering data, initial contact usually from home or ED where information may not be certain or still unfolding." The database is used to assess drug abuse trends, bioterrorism threats and report human poisoning statistics. Approximately 36,000 cases are reported annually. National trend data is available to the public by written request; CT specific data may require Association approval and must follow HIPAA guidelines.</p> <p>CPCC's data are uploaded in real time to the National Toxic Exposure Surveillance System, in which data are monitored for circumstances such as multiple patients reporting similar toxic clinical effects, which may indicate a sentinel event or trend in exposures.</p>

Topic	Database Findings
Mercury Poisoning	<p>Mercury Poisoning is reportable by law whereby laboratories are required to report when a patient's urine level meets or exceeds 35 ug/g creatinine, or blood level meets or exceeds 1.5 ug/dl. The primary database for mercury poisoning in CT is housed at the CT DPH/Bureau Regulatory Svcs/Environmental Health Division/ Environmental &amp; Occupational Health Assessment Program/Occupational Health Unit in the Mercury Poisoning database. This database includes demographic information (age, race ethnicity, gender and date of birth) and disease diagnosis is collect from Physicians Reportable Disease Confidential Case Report. The Mercury Poisoning database is planned to become part of the CEDSS system in the future.</p> <p>Other sources for Mercury Poisoning include the Death Registry, BRFSS, Office of Health Care Access (OHCA), CHIME and TOXICALL</p>
Respiratory Disease/ Asthma	<p>Health Assessment Record: Beginning with the 2003/2004 school year, legislation required that the school Health Assessment Record (HAR) contain a chronic disease assessment including asthma. Each year, school nurses report the age, gender, and race/ethnicity of students in their school who have an asthma diagnosis recorded on the HAR. The law mandates only the reporting of students with a diagnosis of asthma indicated on the HAR, and nurses have repeatedly reported that this results in a drastic underestimate of the number of students with asthma. Another limitation is that there is no standardized software package for school nurses; it is not currently possible to automate the collection of health data from the school HAR. Hence, most school nurses manually review student's HAR's and report in a paper format to DPH</p> <p>The HAR Asthma Database is only one part of the CT DPH asthma surveillance system. Five other data sources have been used for routine surveillance over the past 4 years. Prevalence estimates for adults and children in the general population have been obtained from the Behavioral Risk Factor Surveillance System adult and child asthma modules. Medicaid data has been used to examine the prevalence and health care usage for asthma among children enrolled in HUSKY A. Information on hospitalizations and ED visits for asthma is obtained from CHIME, Inc.; data include information on encounters with a primary or secondary diagnosis of asthma. Data on deaths with asthma identified as a primary or underlying cause are received from the DPH Office of Vital Records. The Asthma Program also received information on individuals who are diagnosed with work related asthma from the Occupational Disease Surveillance System housed with the DPH Occupational Health Program.</p> <p>The Asthma Program, along with other programs within the Department, have experienced difficulties over the past years in getting access to updated hospitalization and ED data that contains identifiers. This lack of current information has hindered surveillance efforts at the state and the community level.</p>

Topic	Database Findings
Autism	By law, the Dept. of Mental Retardation is the lead agency for autism. No tracking database has been identified to date, though this could be investigated further. Most likely any tracking type of information on autism would be very recent. Other information might include services provided, including that from the organization Birth To Three. The Department of Education may also have some data.
Diabetes	No database identified to date.

## Summary of Database Committee Inventory Findings: Environmental Topics

Topic	Database Findings
<p>Ambient Air (Ozone, Sox, Nox, Air Toxics, Particulate)</p>	<p>In accordance with the 1990 Clean Air Act Amendments, EPA has required more extensive monitoring of ozone and its precursors in areas with persistently high ozone levels. Photochemical Assessment Monitoring Sites (PAMS) is an ambient air monitoring site which collects and reports detailed data for volatile organic compounds (VOC), nitrogen oxides, ozone and meteorological parameters.</p> <p>The data set is intended to assist modelers and regulatory agencies in predicting days with poor air quality from ozone and fine particulate matter. Each PAMS analyzer is co-sited with ozone and oxides of nitrogen analyzers as well as meteorological instruments to enhance the value of the data generated. They are sited to meet one of four characteristics:</p> <ol style="list-style-type: none"> <li>1- upwind of urban areas to capture VOC ozone precursors</li> <li>2- in an area of maximum impact from an urban area generating VOC's from traffic and industrial processes</li> <li>3- downwind of an urban area to determine the changes in VOC levels as ozone formation takes place</li> <li>4- far downwind of an urban area to represent the VOC and ozone precursors leaving the area, and potentially impacting other downwind locations</li> </ol> <p>Current Connecticut PAMS sites represent characteristics 1, 2, and 3 above.</p> <p>The data set also provides information on selected air toxic components. However, the PAMS sites are not located in areas meant to optimize air toxic impact at the monitor. PAMS networks typically monitor 56 target hydrocarbons and 2 carbonyl compounds, ozone, oxides of nitrogen (NOx and/or NOy), and meteorological measurements.</p> <p>Compliance Analysis Database and Information System (CADIS) is housed at the EPA/Compliance and Field Operations. This database contains data that determines if a facility's air stacks are within emission compliance.</p> <p>Haze Monitoring is not in a database format. It looks at PM 2.5 data (elemental, organic, ionic species). Data is sent to Colorado State University and lives in a national database used for regional haze analysis/modeling. Haze monitoring is used for verifying air mass trajectory analyses and source-receptor modeling.</p> <p>Northeast States for Coordinated Air Use Management's (NESCAUM) purpose is to exchange technical information, and to promote cooperation and coordination of technical and policy issues regarding air quality control between Northeast states, including New England, NY, and NJ.</p> <p>The Ambient Air Monitoring network has 25 remote Pc's and 2 local Pc's, Poll 1 and Poll 2. Poll 2 is located at 9 Windsor Ave. Windsor and Poll 1 is located at 79 Elm Street in Hartford. Poll 2 calls remote Pc's every 8 hours and uploads the data. At the end of the month all the data is transferred from poll 2 to poll 1 in Hartford. The data group then makes all the checks on the data, converts it to AIRS which is the required format and sends it to EPA.</p> <p>The Ambient air monitoring data base has all the air quality data values.</p>

Topic	Database Findings
<p><i>Continued</i></p> <p>Ambient Air (Ozone, Sox, Nox, Air Toxics, Particulate)</p>	<p>The EPA has developed a computerized ozone mapping system (OMS) that will accept near real time ozone data from state and local air quality management agencies, and generate maps for analysis and public display purposes. The E-DAS Ozone Mapping System module is an addendum to Ambient data acquisition and reporting system.</p> <p>The ESC E-DAS for Windows contains most of the criteria pollutants required to be monitored and reported by the State of Connecticut to EPA under the PPA grant. The data in the ESC system (POLL1 &amp; POLL2) are raw unvalidated data. It reports hourly averages for Carbon Monoxide, Sulfur Dioxide, Oxides of Nitrogen (No, No2, Nox), Ozone and continuous Particulate Matter (PM10 &amp; PM2.5). It also reports hourly averages for Meteorological Parameters: wind speed, wind direction, temperature, dew point, solar radiation, barometric pressure and precipitation. After the data has been Quality Assured it is reported to the AIRS AQS system at NCC in North Carolina.</p> <p>Our non-continuous data (PM10, sulfates &amp; nitrates) received from the State Health Department are processed on the SAS SAROAD legacy system and converted to AQS format for submission to AIRS.</p> <p>Our Precision and Accuracy data is processed in an Excel 2000 workbook with Visual Basic for applications used to automate validation, look ups, and generation of transaction files. These files when complete are also submitted to AIRS.</p> <p>This database contains most of the criteria pollutants required to be monitored and reported by the State of Connecticut to E.PA under the PPA grant.</p> <p>Air Emission Inventory and Point Source/Area/ Mobile (SAS) These two databases (Air Emission Inventory, Point Source/Area/Mobile (SAS)) hold data consisting of Air Emission data from Point Source, Area and Mobile sources. All this data is sent to the National Emission Inventory Database (NEI). EPA's National Emission Inventory (NEI) database contains information about sources that emit criteria air pollutants and their precursors, and hazardous air pollutants. The database includes estimates of annual air pollutant emissions from point, nonpoint, and mobile sources in the 50 States, the District of Columbia, Puerto Rico, and the Virgin Islands. EPA collects information about sources and releases an updated version of the NEI database every three years.</p> <p>Fine Particulate Black Carbon Database: Fine particulate black carbon (BC) is a ubiquitous component of primary source fine particulate matter (PM2.5), such as that emitted directly from vehicles or boiler stacks. In contrast, secondary PM2.5 results from chemical transformations of precursor components from sources at distances of hundreds to thousands of miles upwind. These particles are formed from sulfate, nitrate or ammonium ions in the atmosphere.</p> <p>Connecticut DEP monitors BC at multiple sites primarily to obtain information indicating the nature and extent of Connecticut's local contributions to PM2.5. Additionally, BC is associated with toxic air pollution, since organic toxics that are usually present in combustion by-products, such as polycyclic aromatic hydrocarbons (PAHs), have a strong tendency to adsorb to BC particles. Some of the BC monitoring was funded in part by the National Air Toxic Trends Study (NATTS), stipulating that the BC data be maintained in the EPA Air Quality System (AQS) national database.</p>

Topic	Database Findings
<p><i>Continued</i></p> <p>Ambient Air (Ozone, Sox, Nox, Air Toxics, Particulate</p>	<p>The BC database maintained at the Air Bureau serves to store raw data, process raw data into validated mathematically composited one-hour average values, to prepare text files specifically formatted for uploading to the AQS database, to prepare data sets for various purposes as needed for Air Bureau functions, and to perform analyses of trends over time and in comparison with other pollutants and meteorological variables</p>
<p>Ambient Air Fine Particulate</p>	<p>AIRS/AQS AIRS is the Aerometric Information Retrieval System, and AQS is the Air Quality Subsystem. These terms are used somewhat interchangeably, but AQS is the database and AIRS is the overall data structure.</p> <p>This is a Federal repository for air quality data, and the ultimate destination for concentration data collected from the CT DEP's fine particulate (a.k.a. PMFine, or PM<sub>2.5</sub>) monitoring network. State Code, County Code, Site Code, Parameter Code, Method Code, Owner Code (POC), Interval, and Date Code identify the data. Each Monitor has an owner who can submit data and modify data, but any user can retrieve data. The CT DEP uses AIRS/AQS as a remote database since there is no comprehensive in-house data repository.</p> <p>The CT DEP, and other state, federal, and regional agencies retrieve data from AIRS for their own uses. These include characterization of regional air quality, comparison of air data between different regions, and modeling of air pollution events.</p> <p>Fine Particulate Database QA reporting. Fine Particulate Database/MSAccess QA/Reporting Database. The CT DEP uses a MSAccess-based data management system to collect, edit, and report data from its Fine Particulate Monitoring Network. The data comes from hard-copy lab reports (filter weighing), hard-copy field sheets, and performance data downloaded from the actual samplers and imported to the MSAccess database.</p> <p>This database contains many pieces of peripheral data regarding collection and holding times, sampling parameters, sampler maintenance, ambient conditions, and laboratory conditions, as well as comments from the field and laboratory technicians. This data is used to ensure that the data complies with the federal standards set forth in the Fine Particulate monitoring guidelines (Federal Register Vol 62, No 138, July 18, 1997; Appendix L to Part 50), and the CT DEP's internal Quality Assurance Program.</p> <p>The primary product of the database is concentration and ancillary data formatted for input to the AIRS/AQS federal data repository.</p>

Topic	Database Findings
<p>Drinking Water (Ground water, Surface water, Private well water)</p>	<p>There are four databases that collect data on related water quality issues in CT and may affect the state's drinking water: LISWQMP, SQUID, SITS, and Underground Storage Tank databases.</p> <p><u>LISWQMP</u> covers water quality of the CT shoreline and Long Island Sound using sea water and filters and are reported via laboratory reports since 1991. Dissolved Oxygen, nutrient levels, temperature and salinity concentration levels are collected and provided via media, e-mail and/or hard copy. The database currently houses approximately 45,000 records.</p> <p><u>Sediment Quality Information Database (SQUID's)</u> primary goal is to have a "sediment quality information database" that enhances dredging management decisions such as developing sediment testing plans, selecting priority pollutants for testing, evaluating the suitability of sediments for open water disposal, etc. The database includes all localities proposed for dredging in CT and the NY coast of Long Island Sound. The database includes the following contaminants: heavy metals, PCD's, pesticides, PAH's. Approximately 50 – 60 records reported annually.</p> <p><u>Spill Incident Tracking System (SITS)</u> was created in 1996 to maintain information resulting from hazardous material(s) reported to the Oil &amp; Chemical Spill Response Division. Reporting these releases is required by CT General Statutes. Reports are usually phoned in and entered concurrent to reporting the spill. This data is used to keep track of where releases have occurred, which ERC was assigned the case or if no one responded, what and how much substance was released, the responsible party if known, whether or not the release entered a water-body and if yes, which one and whether or not the release has been terminated. With-in the Division, this database is also used to ensure that the ERC's have completed their reports, planning based on the number of spills, which area of the state they occur and other such planning functions. The database houses 68,557 records and 8,000 – 9,000 incidents are reported annually.</p> <p><u>The Underground Storage Tank Programs</u> have two primary databases - both in Access 2000. The Underground Storage Tank database contains information on sites with registered underground storage tanks which includes: business name address, owner and operator names and addresses, size, construction and age of tanks, type of products contained in the tanks. GPS location data is also maintained and is currently accessed through the DEP ECO system. The GPS data is linked to the registration data.</p> <p>The Leaking Underground Tank database contains tank sites reporting some kind of release to the DEP. New sites are added as they are reported to the DEP. Underground storage tank releases are a subset of releases reported to the DEP Oil and Chemical Spill Division. Since the DEP does not follow up on all sites, the amount and type of data regarding the release in the database may vary. Data includes the type of fuel or substance released, actions taken to stop or cleanup the release, the name of the reporting party, location, soil and groundwater sampling results, and an estimate of the size of the release. There is an estimated 30,000 tanks currently recorded in the database and there are approximately 1,500 releases of commercial and residential tanks annually; there are approximately 10,000 total releases reported in the database to date.</p>

Topic	Database Findings
Fish tissue (Mercury, PCB's)	<p>The <u>Beach Database</u> provides the fundamentals for the Connecticut Water Quality Report to Congress (305b Report). The Federal Clean Water Act requires each state to assess the quality of its surface and tractable ground waters every two years. Water quality is assessed in terms of designated uses, such as aquatic life and recreation. Data has been collected since October, 1995. Data is collected quarterly and manually entered. The following records are reported annually: trips = 100 – 200; samples = 400 – 800; media = 800 – 1600; results = 24,000 – 48,000.</p>
Indoor Air (Including radon)	<p>Monitoring of indoor air quality is under the auspices of DPH. So far one program has been identified as a possible source for indoor air quality information: the Tools for Schools Program. This program trains school staff on protocol for indoor air monitoring. An identified team at each school uses a check list to review items such as: Is the classroom clean? Have trash cans been collected? Are there any leaks in the roof? How is the ventilation system? and so on. The information is currently used to make recommendations to the school system. The program is in an early phase of implementation.</p>
Pesticides	<p>There are two pesticide databases: Aquatic Pesticide Permits (PAMS) and Private Applicator Pesticide Use. PAMS is used to track all related pesticide permit application information. This database has existed since January 1995 and approximately 550 applications are reported annually.</p> <p>Private Applicator Pesticide Use is a paper database which consists of all restricted pesticide permits individuals apply for. Maintained since 1987. Average annual cases and total number of cases are unknown.</p>

