Environmental Health

2002

Within these pages is a record of the activities that engage the minds and hearts of the people of the Centers for Disease Control and Prevention (CDC) who work at the National Center for Environmental Health. It is as well an affirmation of the importance we place on working across disciplines with a host of governments and agencies to improve the health of people in this country and across the globe. The programs we're involved with remind us on a daily basis of the diversity of the people we serve and the problems they face.

This book also reminds us that our predecessors at CDC were visionaries. Without their foresight, we would be unable to do much of the work that others now often consider routine. However, we must be vigilant about resisting complacency, because we still have much to accomplish. In this nation alone, we will double our population during the next 100

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OUR VISION, OUR MISSION, AND OUR PARTNERS

OUR VISION

Healthy people
in healthy communities
free from disease
due to the environment

OUR MISSION

To promote health
and quality of life
by preventing or controlling
those diseases or deaths
that result from interactions
between people
and their environment

OUR PARTNERS

State and local health departments
Other CDC centers, institute, and offices
Other federal agencies
Foreign governments
International health organizations
Nongovernmental organizations
Academic institutions
Philanthropic foundations

CDC's environmental health work cuts across several centers. Here at the National Center for Environmental Health, we focus on the following program areas:

- Safeguarding the health of people from environmental threats
- Providing leadership in the use of environmental health sciences—including environmental epidemiology, environmental sanitation, and laboratory sciences—to protect public health
- Responding and sharing solutions to environmental health problems worldwide
- Communicating information about genes, diseases, and environmental risk factors

The following paragraphs provide an overview of divisions and offices that are actively engaged in environmental health activities.

The Division of Environmental Hazards and Health Effects (EHHE) conducts surveillance and investigations that increase knowledge about the relation between human health and the environment and uses this knowledge to develop national public health programs and policies aimed at preventing disease. EHHE studies ways to prevent or control health problems associated with exposure to air pollution, nuclear radiation, lead, and other toxicants, as well as those health problems resulting from natural and technologic disasters.

The Division of Emergency and Environmental Health Services (EEHS) provides national and international leadership in coordinating, delivering, and evaluating emergency and environmental health services. EEHS helps local, state, federal, and international agencies plan, prepare, and respond to emergencies, including terrorist attacks, technologic accidents, and natural disasters. EEHS also provides grants, technical assistance, scientific guidance, and in some cases, direct service delivery to state, local, and nongovernmental agencies engaged in environmental health services such as food safety, rodent control, water quality, and sanitation.

The Division of Laboratory Sciences (DLS) develops and applies laboratory science to prevent disease and death caused by exposure to environmental chemicals and to improve the diagnosis, treatment, and prevention of selected chronic diseases. DLS specializes in biomonitoring, which is the assessment of individual human exposure to environmental chemicals by measuring them in human specimens (e.g., blood or urine). Biomonitoring provides valuable and unique information that guides health officials in risk assessment, treatment, and prevention.

The Office of Global Health works with partners to improve health worldwide. Five global priorities of this office are childhood lead poisoning prevention; water, sanitation, and hygiene; urban health and megacities; micronutrient malnutrition; and emergency preparedness and response.

The Office of Genomics and Disease Prevention (OGDP) integrates advances in human genome discoveries into public health research, policy, and programs. OGDP's activities focus on conducting applied research, evaluating genetic testing, disseminating information, and training the public health workforce.

The work we do in environmental public health is based on strong science and focuses on linking environmental conditions with specific measures of human health—the goal of which is to discover specific public health interventions to improve human health. Such meaningful efforts, which influence the quality of life of people in this country and throughout the world, comprise the essence of our environmental health work.

Accomplishments

Link Studied Between Exposure to Environmental Tobacco Smoke in the Home and Exacerbation of Asthma Exposure to environmental tobacco smoke (ETS) has been linked to the increased incidence, frequency, and severity of asthma among children, particularly among those from lower socioeconomic-status households. CDC examined household smoking behavior and ETS exposure among predominately ethnic minority children with asthma who live in low-income households where people smoke. The study also assessed the relation between ETS exposure evaluated by using questionnaires and exposure determined by assessing biomarkers (i.e., levels of cotinine, a nicotine metabolite, in children's urine). Results indicated that in the predominately Latino population surveyed during this work, the level of exposure to ETS in the home was relatively low, and this finding was most notable in the least acculturated (i.e., recent immigrant082 Tc 0.2231 rEoby u46ring th270n betwei.e.j Tvari Tj Tinate.4 -un immfe aivelg

More Health Departments Funded to Develop and Implement Asthma Control Programs In 2001, CDC provided funds to 13 additional state health departments plus the Washington, D.C., Health Department to develop or implement asthma control programs. This brings to 26 the number of health departments now receiving funds to plan programs that will have surveillance, intervention, and partnership components. The 25 states funded for asthma control programs are California, Colorado, Connecticut, Georgia, Idaho, Illinois, Iowa, Maine, Maryland, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New Mexico, New York, Oregon, Rhode Island, Texas, Utah, Vermont, Virginia, West Virginia, and Wisconsin.

Funds Provided to Implement Asthma Interventions Within the past year, CDC funded eight sites to implement one of two proven asthma interventions (Asthma Care Training for Kids and Open Airways for Schools). The purposes of these funds are to decrease hospital and acute care visits and to increase compliance with asthma care and medication plans. The eight sites are Chula Vista Elementary School District (California); Bronx-Lebanon Hospital Center (New York); the American Lung Association of Metropolitan Chicago; the American Lung Association of Colorado; the Philadelphia Department of Health; Harris County Hospital District (Texas); Babyland Family Services, Inc. (New Jersey); and the Asthma and Allergy Foundation of America (Washington State chapter).

CDC Organizes a Public Health Response to Asthma CDC and the Public Health Training Network conducted live interactive satellite broadcast training, "A Public Health Response to Asthma," on May 17, 2001. More than 1,000 people received continuing education credit for the broadcast, which provided an overview of the disease and demonstrated sound approaches for conducting asthma surveillance, building statewide coalitions, and implementing interventions in schools. Several state health departments used the broadcast as a kickoff event for their scheduled asthma coalition meetings.

Funds Provided to Seven Grantees for Controlling Asthma in American Cities Project CDC provided funds to seven grantees to use innovative collaborative approaches to improve overall asthma management among urban children and adolescents up to 18 years of age. The grantees are the St. Louis Regional Asthma Consortium, Children's Hospital of Philadelphia, the American Lung Association of Minnesota, the University of Illinois, Columbia University (New York), the Central Virginia Asthma Consortium, and the University of California. The desired outcome of this project is a decrease in asthma-related morbidity.

Asthma Case Tracking Under Way To provide better estimates of asthma incidence, CDC is funding the Kaiser Foundation Research Institute (Portland, Oregon) and the Miami-Dade County Health Department (Miami, Florida) to develop

models for identifying new asthma cases. This project will define a network of providers within each population base and determine the health care utilization practices of people with asthma

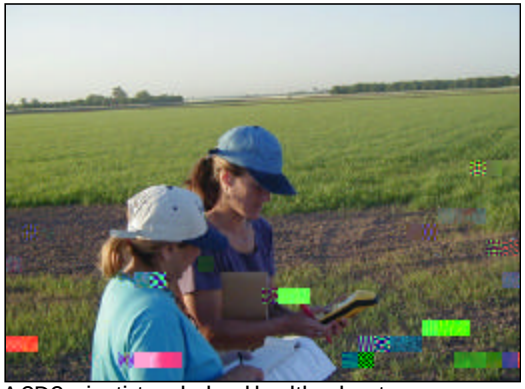
Methods

New Methods Strengthen Biomonitoring Capacity During fiscal year 2001, CDC laboratory scientists developed several new methods for measuring low levels of environmental chemicals in people. These methods, which are essential to studying the relation between exposure levels and adverse health effects, will help public health officials, physicians, and researchers learn more about what chemicals are getting into people's bodies. Hazardous substances that can be better measured in blood and urine using these new methods include the following:

- Polyaromatic compounds, many of which are known to be carcinogenic. CDC currently is analyzing the blood and urine specimens of firefighters who responded to the World Trade Center (WTC) attack to determine whether they were exposed to these chemicals.
- Phthalates, which are chemicals that have the potential to be hormonally active and are found in soap, shampoo, hair spray, nail polish, and durable and flexible plastic products. Phthalates given at very high doses to pregnant animals have caused birth defects among offspring.
- The endocrine disruptor bisphenol A, which is used in dental sealants.
- Nonpersistent pesticides.
- Nicotine, nicotine metabolites, free nicotine, and menthol from tobacco products. The method for measuring menthol is particularly noteworthy, given that African Americans who smoke mentholated cigarettes may have an increased risk for smoking-related disease.
- Trihalomethanes, which are

- Mercury, uranium, thorium, and both total and speciated arsenic.
- Selenium, an element essential to human health but toxic at high levels.
- Plutonium, a deadly radioactive element.
- Volatile organic compounds (VOCs), some of which are associated with cancer and neurological dysfunction. CDC developed an improved method for measuring 31 different VOCs in human blood. By improving methods of sample handling, analysis, and data

The Role of Biomonitoring in Public Health Investigations



A CDC scientist and a local health educator use a global positioning system to plot sample extraction locations for investigating children's exposure to pesticides in Yuma County, Arizona.

indicate that the pesticides generally pass through the placenta and thus expose the fetus to these pesticides, which are neurotoxicants.

Proximity to Agricultural Fields Is Not Significantly Associated with Overall Pesticide Levels in Urine In 2001, CDC completed an investigation of exposure of children to pesticides in Yuma County, Arizona. The purpose of this cross-sectional study was to determine whether children who lived or attended school in the vicinity of agricultural fields were exposed to greater amounts of pesticides than were children who lived or attended school further from agricultural fields. From October 1999 to February 2000, CDC collected urine and dust samples; a total of 152 households and six schools participated. Urine samples were tested for organophosphate pesticide metabolites, and dust samples were tested for 43 specific pesticides. Levels of pesticide metabolites in urine and levels of pesticides in dust were low. There was no association between the summary variable of all pesticide metabolites in urine and distance from agricultural fields. However, there was an association between distance and some of the individual pesticide metabolites in the urine.

Building State Capacity in Biomonitoring

Funding Awarded to States In 2001, CDC awarded 25 planning grants totaling $5 million to 33 states to develop, implement, and expand state-based biomonitoring programs to help prevent disease from exposure to toxic substances. Individual states, as well as consortia comprising several states, received funding. Grants are designed to help states strengthen their public health infrastructure. States will also be able to plan how they will track exposure trends and assess effectiveness of efforts to reduce exposure to toxic substances. Finally, states will be able to increase their capacity to measure many toxic substances in people, including such vulnerable groups as children, the elderly, and women of childbearing age.

Public Health Emergency Response

Unannounced Bioterrorism Exercise Held A full field exercise developed and managed by CDC called "Exercise Hanuman Redux 2001" (HR 2001) was held during 2 days in August 2001 in Louisville, Kentucky. It was one of a very few "no-notice" (unannounced), 24/7, player-driven exercises ever held in the United States. From the local perspective, the August exercise evaluated the community's ability to execute its emergency operations plan, policies, and procedures and use its systems and facilities to deal with a bioterrorism event. In response to the exercise scenario, CDC rapidly field-deployed two

emergency response coordinators and 10 epidemiologists to investigate the event. HR 2001 marked the first time the National Pharmaceutical Stockpile Program had field-deployed its assets. The lessons learned from HR 2001 proved invaluable in responding to the World Trade Center and Pentagon events less than 1 month later.

Emergency Response Efforts Put into Action on September 11 During the past several years, CDC has responded to a variety of natural and technologic disasters, each of which had significant public health consequences. CDC also participated in chemical, radiological, and biological terrorism exercises. These activities proved invaluable in preparing CDC emergency response personnel to rapidly and effectively respond to the event that began September 11. CDC's Emergency Operations Center was functioning within minutes of the World Trade Center and Pentagon attacks, maintaining 24/7 coverage through mid-December. CDC also deployed hundreds of specialists to New York City to conduct on-site activities. These activities included serving as a liaison with other federal agencies and the New York state and city health departments in areas such as worker protection

Specialized containers designed to fit into wide-bodied aircraft enabled thousands of pounds of antibiotics, medical supplies, and protective equipment to be shipped through the National Pharmaceutical Stockpile Program to rapidly respond to the September 11 and anthrax attacks.

grants: $4.8 million to the New York City fire department and $2.4 million to the New York State Department of Health to conduct biomedical monitoring for responders at Ground Zero.

Nearly 3.75 Million Antibiotic Tablets Delivered to Treat Anthrax CDC's National Pharmaceutical Stockpile (NPS) Emergency Operations Center was still fully functioning with staff on 24-hour alert after the September 11 attacks when CDC responded to the first case of anthrax in Florida. At the request of state and local officials, CDC, through the NPS Program, arranged for the transportation of a CDC epidemiologist and the NPS Program's Technical Advisory Response Unit to Florida and North Carolina to investigate and respond to anthrax exposures. CDC also transported specimens and a CDC epidemiologist to a specialty lab in Flagstaff, Arizona. From October 15 to November 29, CDC delivered nearly 3.75 million tablets of three different antibiotics (amoxicillin, ciprofloxacin, and doxycycline) for postexposure preventive treatment of postal workers, mail handlers, postal patrons, and other employees in affected buildings. CDC accomplished this feat in response to 65 separate requests from 10 different states and the District of Columbia. CDC's average response time from request to delivery was 5 hours.

CDC and New York City Department of Health Collaborate on Post-September 11 Health Assessment The New York City Department of Health (NYCDOH) and CDC collaborated on an assessment of health effects and needs among residents of Lower Manhattan affected by the evacuation and environmental contamination caused by the attack on the World Trade Center. Staff from NYCDOH and CDC developed a questionnaire to obtain information from residents concerning (1) demographics, (2) access to utilities and health services, (3) mental and physical health status, and (4) urgent needs and concerns. The survey instrument included a 17-item screening test for symptoms of posttraumatic stress disorder validated for a U.S. population. Survey teams comprising CDC and NYCDOH staff members received training on how to administer the questionnaire and respond to interviewee concerns. From October 25 through November 1, 2001, these teams conducted 414 interviews of statistically representative, randomly selected households from three well-defined communities in Lower Manhattan. Within 1 week of data collection, CDC provided NYCDOH with a report that included recommendations for public health interventions. On the basis of the results of this assessment, NYCDOH developed a plan to facilitate communication, mitigate the effects of poor air quality, and address mental health concerns in these neighborhoods.

Terrorism Response Planning Guidance Put on the Web The planning guidance for biological and chemical terrorism response recently Web-posted by CDC is designed to help state and local public health officials determine the roles of their departments in responding to biological and chemical terrorism and to understand how public health response activities fit within the overall federal, state, and local emergency management system. This guidance can also be used to help health departments coordinate their efforts with the many agencies and organizations at all levels of government that ultimately would respond to a biological or chemical terrorism event. The 106-page guidance document is available on CDC's Web site at http://www.bt.cdc.gov/documents/planning/planningguidance.pdf.

Training Video Created for State and Local Health Departments The ability of public health and emergency management officials to provide a coordinated response at the local level has

assets in an emergency situation. The video format is particularly important because push package sites are at undisclosed locations and cannot be toured. (A push package is a portable, fully stocked repository of drugs, antidotes, and medical/surgical supplies designed to resupply state and local public health agencies within 12 hours of a terrorism incident.) For most public health and emergency management planning officials, this video will provide the only opportunity for them to view a push package.

Applied Research Leads to Program Innovations In 2001, CDC conducted applied

Reproductive Health has in the past few years provided the first epidemiologic assessments of the burden of reproductive health-related morbidity and mortality in several refugee camps worldwide. These activities were initiated and led by members of the first and second IECD classes, which graduated in 1997 and 1999.

Palau Center for Emergency Health Established As part of the Pacific Emergency Health Initiative, CDC staff traveled to Palau in September 2001 to launch the Palau Center for Emergency Health (PCEH), the first Pacific regional training center for emergency public health and medical facilities. PCEH is a CDC venture developed in partnership with the Republic of Palau and the Palau Community College. In addition to opening the center, CDC representatives conducted two training sessions for 11 Pacific Island nations participating in PCEH. The first course, the Emergency Public Health Planning Workshop, introduced the participants to the fundamental concepts of emergency preparedness as applied to the public health and medical effects of natural and technological disasters. Each of the participating jurisdictions ended the 40-hour course by developing public health emergency operations plans. The second course, the Emergency Medical Services Workshop, provided 80 hours of hands-on emergency medical services training to first responders.

The first class to graduate from the Palau Center for Emergency Health (PCEH). PCEH, opened by CDC in 2001, trains citizens of 11 participating Pacific Island nations on fundamental concepts of emergency preparedness and emergency medical services.

Childhood Lead Poisoning Prevention

Lead Screening Plans Submitted to CDC An important element of a comprehensive program to eliminate childhood lead poisoning is an effective lead screening strategy. The goal of lead screening is to identify children who need individual interventions to reduce their blood lead levels. CDC is committed to eliminating childhood lead poisoning by 2010. Because childhood lead poisoning no longer is considered to be a broad, society-wide problem but rather one that exists in particular at-risk populations, CDC refocused its intervention efforts and has been conducting high-intensity targeted screening in specific communities. When this crucial effort has been completed, the

path will be paved for the implementation of effective and successful interventions. In 2001, all lead grantees developed and submitted their screening plans to CDC. These plans are currently undergoing review.

Regional Lead Conferences Generate Great Interest Eight regional lead conferences (Pittsburgh, Pennsylvania; Portland, Maine; Asheville, North Carolina; Indianapolis, Indiana; Austin, Texas; Des Moines, Iowa; Salt Lake City, Utah; and Oakland, California) were held during 2001 to give state and municipal Childhood Lead Poisoning Prevention Program (CLPPP) grantees and CDC the opportunity to participate in formal and informal dialogue and to exchange

environmental assessment teams. A high prevalence of mold growth was identified in more than 60% of the homes surveyed during the visual inspection. In addition, a number of critical public health threats were discovered, including several electrical system hazards; two gas leaks; several sewage/sump pump leaks; several pest infestations; and in one home, the potential for carbon monoxide poisoning. This project will help researchers understand environmental factors associated with mold growth, knowledge that in turn will help improve problem housing and that may help eliminate environments that allow molds to thrive.

Native American Tribes Receive Radiation Dose Estimates CDC provided Northwest Native American tribes with radiation dose estimates for representative individuals who were exposed to radioactive iodine released from the Hanford Nuclear Reservation in Washington State. These dose estimates will help members of eight separate Native American tribes and nations determine how historic releases of radioactive iodine from Hanford may have affected their health. These dose estimates are based on specific Native American lifestyle and dietary practices that individual tribes reported.

Environmental Health Services

Chemical Weapons Disposal

Progress Continues in Disposing of Stockpiled Chemical Weapons CDC continues to maintain a strategic partnership with the Department of Defense involving funding in excess of $1 million to support CDC's oversight of the safe disposal of the nation's chemical weapons. This partnership enables CDC to effectively protect the health of the almost one million people working or living near chemical weapons stockpile sites. Since September 2001, more than 14.9 million pounds

of chemical agents and weapons have been

of eight continental U.S. chemical weapons stockpile sites. Prior to destruction of chemical weapons, the U.S. Army is required to monitor them to verify that there are no leaks posing a health risk to the workers or the community. CDC conducted a thorough technical evaluation of the chemical agent monitoring program put in place by the U.S. Army at UMCD. Overall, the monitoring strategy was deemed to be protective of public health. CDC did provide some recommendations for improvement, which were implemented by the U.S. Army.

New Chemical Agent Monitoring Concepts Explored CDC met with Oregon state officials and U.S. Army officials to review innovative monitoring technologies that are able to detect more than one type of chemical agent at the same time. Simultaneous detection of more than one chemical agent is helpful at a chemical agent disposal facility that must destroy multiple agents. CDC formulated a preliminary monitoring strategy that makes recommendations from the perspective of public and worker health protection.

CDC Meets with Concerned Citizens One way in which CDC fulfills its role of oversight of eight chemical weapons stockpile sites is to meet with potentially affected local citizens to address their concerns. Currently, only one stockpile site is destroying chemical agents in the continental United States. Two other sites are scheduled to begin disposal operations within the next year. As these facilities near completion, members of the public are requesting more independent public health information. In response to their requests, CDC has visited the disposal sites and met with community members to address their concerns about chemical weapons disposal near their homes.

Capacity-Building Activities

Strategy Implemented for Reviving Environmental Health Services System CDC followed a rigorous schedule in producing a strategy to revitalize the environmental health services system in the United States. Although many major accomplishments have been made in the environmental health services field, over time the resources and capacity of public health agencies to deliver environmental health services have steadily declined. The initial draft of the strategy was developed in 3 months with the participation of an internal steering committee and a 31-member external partners working group representing the environmental health and protection practice community; special populations; academia; advocacy groups; and representatives from the Agency for Toxic Substances and Disease Registry as well as other CDC centers, institute, and offices. The draft plan, which is viewed as a working document, has been reviewed by more than 100 additional environmental health and public health experts and advocacy organizations. CDC made significant progress toward revitalization in 2001 by awarding millions of dollars to state and local health departments and universities to build public health capacity and improve environmental health services. The next step is to

In 2001, CDC made significant progress toward revitalizing the environmental health services system in the United States.

finish identifying needed resources, organizing and implementing activities described in the strategic plan, and creating a time line for accomplishing the objectives.

CDC Awards $3 Million in Cooperative Agreements to Boost Environmental Health Services As part of its plan to revitalize the nation's environmental health services system, CDC awarded $1.5 million in cooperative agreement grants to three state and four local health departments. The grants cover several different projects or focus areas, such as building environmental health capacity in state and local health departments and controlling rodents and improving unhealthy home environments in Philadelphia and New York City. CDC also awarded $1 million in cooperative agreement grants to four universities to support a program called "Building Communities of Excellence in Environmental Health." This program uses schools of public health to assist state and local health departments in developing state-of-the-art environmental health programs. Additionally, CDC awarded $500,000 to four other universities to improve the ability of environmental health programs and practitioners to provide environmental health services nationwide. These cooperative agreement funds will enable the universities to determine which procedures are effective for conducting environmental assessments at public events, to develop training modules on essential environmental health services, and to craft training modules for practitioners new to the field of environmental health.

Environmental Health Specialist Network Expanded In fiscal year 2001, CDC awarded $700,000 to seven additional states to implement the Environmental Health Specialist Network (EHS-Net). EHS-Net was created to facilitate the exchange of information and ideas between epidemiologists and environmental health specialists. EHS-Net is based on the existing infrastructure of FoodNet, which is a Web-based communications tool that addresses the needs of food professionals in various occupations. EHS-Net is designed to (1) enable understanding of the environmental causes of foodborne illness; (2) strengthen the relationships among epidemiologists, environmental specialists, and laboratory staff at the state and local levels; and (3) identify and offer training opportunities for environmental health specialists. Currently, an EHS-Net partnership exists among CDC, the Food and Drug Administration, and eight states (California, Colorado, Connecticut, Georgia, New York, Minnesota, Oregon, and Tennessee). An EHS-Net environmental assessment tool is undergoing pilot testing.

Workshops on Drinking Water Systems Conducted Up to half of the population of some states in this country drink water from small systems not regulated by the Safe Drinking Water Act. The quality of the drinking water from these systems is generally unknown and may be suspect. For these reasons, CDC convened two workshops to allow state and local practitioners to present their perspectives, discuss public health problems, and explore avenues for resolving issues pertaining to small, nonfederally

regulated drinking water systems. Three broad areas of common concern were identified: (1) state and local resources are inadequate for addressing issues related to small systems, (2) members of the general public being served by these small systems are often overconfident or complacent about their drinking water quality, and (3) states need technical assistance and guidance in developing and maintaining these systems. CDC is working with state and local representatives to prepare a joint report describing the issues and potential strategies to address the concerns.

Cause of Wyoming Waterborne Outbreak Identified

Administration Model Food Code required by the new manual. CDC conducted a series of training sessions on the new requirements, followed by unannounced operational inspections of the vessels to ensure implementation and compliance. Procedures and instructions on how to design and build potable water systems and food-handling areas for cruise vessels were

CDC and ATSDR have begun developing practical recommendations for implementing the proposed plan. These workgroups and the issues they will address are as follows:

- **Organization and management** to (1) define roles and establish collaborative linkages among state and local public health and environmental agencies and among CDC/ATSDR, EPA, and other partners and (2) identify state and local capacity needed to implement the tracking network

- **Data technology and tracking methodology** to (1) identify relevant national data standards, (2) establish system specifications, and (3) describe potential prototypes or models for automating, linking, and analyzing hazard, exposure, and health-outcome data

- **Tracking system inventory and needs assessment** to (1) identify and describe existing tracking systems at the national, state, and local levels, (2) determine priorities for integrating existing tracking systems, and (3) identify and prioritize the development of new systems

- **Translation, policy, and public health action** to define state, local, and federal actions that can ensure a rapid and effective response to data and other information generated by the environmental public health tracking network (e.g., implementing disease prevention strategies and initiating prevention research)

To date, CDC and ATSDR have cosponsored a kickoff meeting in Atlanta for workgroup members. In addition, one workgroup already has crafted recommendations for the plan's implementation.

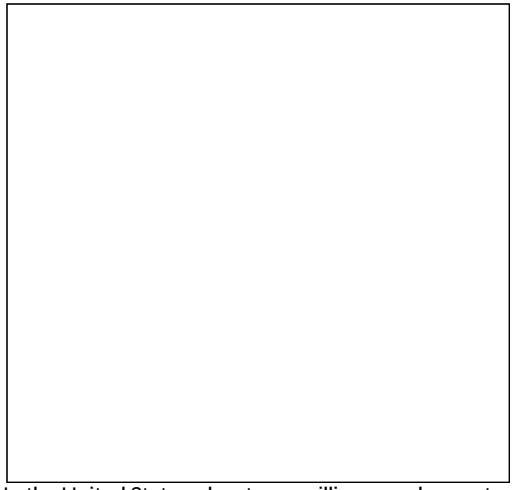
Genomics

New Centers for Genomics and Health Established In 2001, CDC awarded funding to three schools of public health, establishing the first Centers for Genomics and Public Health. The University of Michigan, the University of North Carolina, and the University of Washington will each receive approximately $300,000 per year for 3 years. Through a cooperative agreement between the Association of Schools of Public Health and CDC, each center will develop a regional hub of expertise to use information about gene-environment interactions associated with disease to develop new strategies for improving health. The centers will build on and complement existing programs at the universities (in public health, medicine, genetics, and other disciplines) and will establish relationships with local and state health departments.

Centers may also draw on other regional resources, such as professional organizations, the clinical community, and industry, to develop activities in three areas: contributing to the knowledge base on genomics and public health; providing technical assistance to local, state, and regional public health organizations; and developing and providing training for the current and future public health work force. Although some of these activities now exist at schools of public health, the prevailing thought is that establishing the centers will generate a high level of synergy, collaboration, and networking among schools of public health and other public health institutions. With this collaborative approach, CDC hopes to draw attention to gaps in translating gene discoveries into disease prevention and to demonstrate, through examples, a way to begin addressing the gaps.

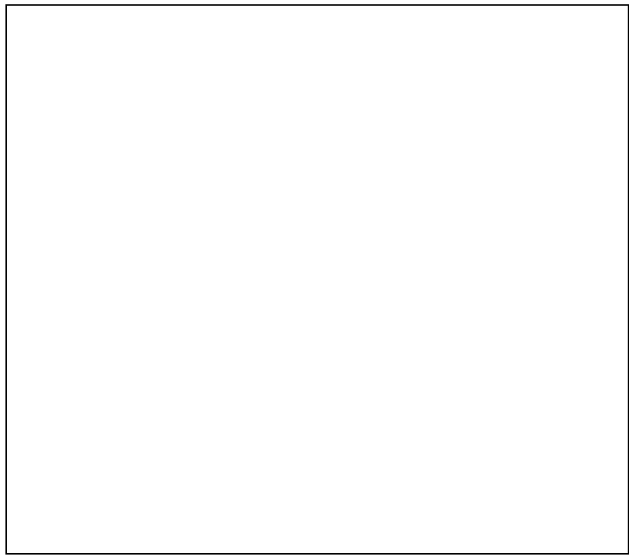
Genomics Toolkit Project Initiated Building capacity in genomics in state public health agencies requires tools that are useful in achieving the aims of health promotion and disease prevention. Success also depends upon a sufficient level of commitment from public health agencies to use these tools in public health programs. To help make these tools readily available and to encourage the commitment to use them, CDC is developing a Genomics Toolkit for state and local public health agencies. The toolkit will be the product of a working group coordinated and convened by the Association of State and Territorial Health Officials (ASTHO) that includes representatives from CDC and other public health organizations with interests in laboratory science, chronic disease, public policy, genetics, maternal and child health, local public health, and epidemiology. The project is also being guided by the results of ongoing needs assessments of state and local public health agencies. The Genomics Toolkit is intended to be an evolving document that will be updated as new resources are identified and as genetic science evolves.

Public Health Impact of Genetic Tests Assessed at the End of the 20th Century As more genetic tests are considered for population screening, and as associations among genes, environment, and common diseases are discovered, the number of people who might benefit from genetic testing will most likely



In the United States, about one million people, most of them children, have type 1 diabetes, an autoimmune disease in which the body destroys the pancreatic cells that make insulin.

Major New Genetic Resource Launched
CDC is collaborating with the Juvenile Diabetes Research Foundation, the Joslin Diabetes Center, and George Washington University to determine genetic risk factors for diabetes and its complications. In June 2001, CDC began testing and banking samples for researchers throughout the world through the Genetics of Kidneys in Diabetes (GoKinD) Study. In the course of developing methods for genotyping in the study, CDC encountered a major problem. One of the genes, DQA1, has many different forms in the population. If the gene is genotyped using conventional direct sequencing, the sequences for some people are garbled and do not "line up" correctly, and the identity of the gene cannot be determined**.**



In the Genetics of Kidneys in Diabetes study, CDC is testing and banking genetic samples with which scientists can learn to identify people at risk for developing diabetes and its complications.

CDC scientists solved the problem by separating the forms of the gene so that each could be sequenced separately and by designing a novel spreadsheet so that individual forms of the gene could be identified easily from the sequence. The carefully characterized samples in this collection will provide high-quality genetic material for determining the contribution of candidate genes and genomic regions to the development of type 1 diabetes and its complications. The GoKinD Study will help scientists across the world understand the genetics of diabetic kidney disease by providing them with sets of samples that help them learn how to identify people who may be at risk of developing diabetes and its complications.

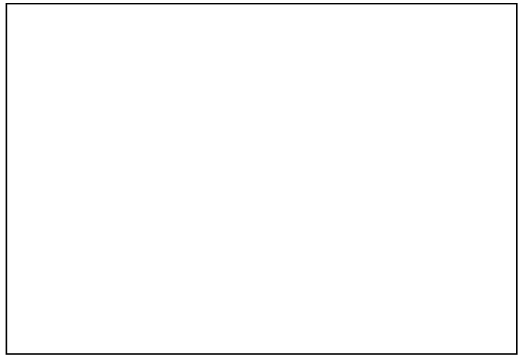
CDC Collaborates with Seven States to Identify Risk Factors for Birth Defects CDC is collaborating with seven states on one of the largest case-control studies ever conducted to identify risk factors for birth defects. The National Birth Defects Prevention Study is unique in that it will identify infants with major birth defects from population-based registries using improved case definitions; interview mothers about their medical histories, environmental exposures, and lifestyles; collect cheek swabs from infants and parents to study gene-environment interactions; and establish a specimen bank to store medical th s1o Tw (wehmm) Tj y . mental exp0 T exp09 arblL2 12 Tj i(CD019 Tcesttudy even

quality control program. CDC's environmental health laboratory not only developed and implemented genotyping methods that ensure the identity and quality of specimens but also coordinates the specimen bank. To date, cheek-swab specimens have been collected from 1,200 study participants.

Human Genome Epidemiology Network Expanded The Human Genome Epidemiology Network (HuGENet™), a global collaboration of individuals and organizations that develop and share epidemiologic information about the human genome, has expanded its Web site with the inclusion of HuGE Case Studies, the HuGE E-Journal Club, and the HuGE Published Literature Database.

The purpose of HuGE Case Studies is to train health professionals in the practical application of human genome epidemiology and to help readers acquire conceptual and practical tools for critically evaluating the growing scientific

environmental risk factors is complex and must be communicated in a way that is meaningful for professionals in public health and related health professions. CDC has developed a communication tool designed to present scientific information in a clear and factual manner to a diversified audience. Each Public Health Perspective is essentially a Web site that contains information and commentary on a single topic. Complex topics such as hereditary hemochromatosis, informed consent, pharmacogenomics, and genetic testing are examined from a public health perspective. Readers will find both scientific information as well as popular press news stories, videos, and commentary geared to public health professionals. This "something for everyone" approach allows readers to examine and understand discoveries of genetic variants; related disease outcomes; and complex social, legal, and ethical issues surrounding genetic



Two men sit outside an Afghan refugee camp. CDC is addressing the Afghan crisis on several fronts, including improving refugee health, coordinating the measles immunization campaign, and partnering with other organizations to resolve the problem of landmines and unexploded ordnance.

intervention programs for addressing these mental health issues.

Training Manual for Humanitarian Assistance Developed In 1997, a group of humanitarian organizations launched the Sphere Project to improve the quality of assistance provided to people affected by disasters and to enhance the accountability of the humanitarian system in disaster response. CDC recently drafted the *Sphere Training Manual* to accompany *The Sphere Project Humanitarian Charter and Minimum Standards in Disaster Response*. The objective of the manual is to provide training to individuals and organizations involved in humanitarian assistance on the public health priorities and minimum standards during emergencies. This training is expected to minimize preventable diseases in emergency situations. The manual will be piloted in 2002.

Mexico and Peru Welcome Intensive Environmental Epidemiology Training CDC conducted two week-long training courses at the National Institute of Public Health of Mexico in Cuernavaca. The first course was an applied course designed to train health officials on practical skills needed to perform health needs assessments and environmental exposure assessments in communities affected by natural disasters. The second course was an environmental epidemiology course that covered the fundamentals of epidemiology, the specifics of environmental epidemiology, and the basics on how to design and conduct environmental epidemiologic studies. This course was also taught in Lima, Peru, and comprised five lectures designed to address the specific environmental epidemiology needs of Latin American countries. The intention of the latter course was to enable each module to stand alone so that a student or group could choose the specific module(s) that best met their needs. The course is being converted into a distance-based learning course for Spanish speakers.

A CDC laboratorian injects calibration compound into a mass spectrometer used to measure levels of persistent organic pollutants in human samples.

CDC Contributes Biomonitoring Expertise to International Agreement In fiscal year 2001, CDC continued to assess human exposure to persistent organic pollutants (POPs) and to determine the human health effects of such exposure. POPs are chemicals that persist in the environment, bioaccumulate through the food chain, and pose a risk of causing adverse effects on human health. These chemicals, which include

polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzo furans, polychlorinated biphenyls, and nine chlorinated pesticides, were the subject of the Stockholm Convention Treaty, which called for global actions to reduce and eliminate releases of these chemicals. The treaty sets out control measures covering the production, import, export, use, and disposal of POPs. Governments are to promote the best available technology and practices for replacing existing POPs while preventing the development of new ones. More than 100 nations, including the United States, signed the treaty in May 2001.The treaty has yet to be ratified, but CDC is helping formulate guidelines to assess the effectiveness of the treaty after it is ratified and implemented.

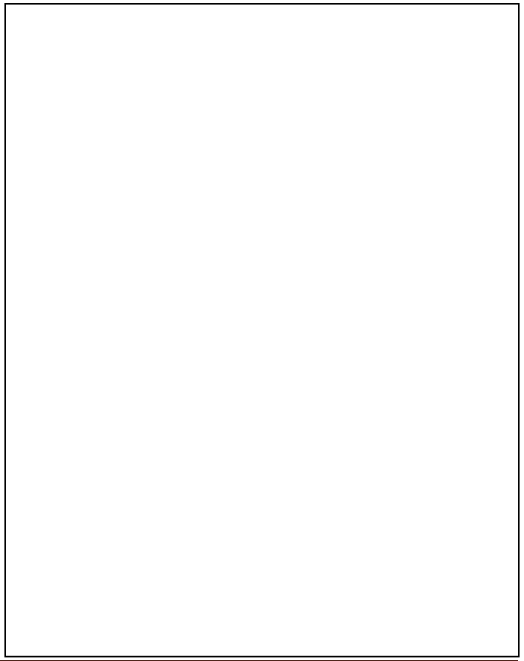
for 90% of all households in the world to consume adequate amounts of iodized salt. The key to reaching that goal is assessing iodine

significant health risk for many nonsmokers, especially vulnerable groups such as pregnant women and children. Beginning with the National Health and Nutrition Examination Survey (NHANES) III (1988–1994), CDC's environmental health laboratory analyzed serum cotinine levels using a sensitive method developed at CDC for NHANES participants aged 4 years and older to evaluate tobacco smoke exposure. During fiscal year 2001, CDC's environmental health laboratory reported serum cotinine results from the analysis of 3,242 individuals who participated in NHANES 1999. Groups previously found in NHANES III to be at elevated risk for ETS exposure, including non-Hispanic blacks, males, and children, also had relatively higher exposure levels in NHANES 1999. However, ETS exposure levels of the overall population in 1999 were much lower than in NHANES III, documenting a significant and continuing decline in the exposure of the U.S. population to ETS during the past decade and reflecting substantial progress by the public health community in reducing ETS exposure.

New Cotinine Analysis Measures Passive Exposure Levels Among Pregnant Women

Previous studies have suggested that exposure of pregnant women to environmental tobacco smoke may contribute to adverse birth outcomes, including an increased risk of giving

CDC continued its investigations of the health effects of cigarette smoking with several important studies related to hazardous constituents in tobacco.



In a study of how prenatal nicotine exposure influences newborn heart rates, CDC found that pregnant women who smoke are greatly increasing their babies' risk for sudden infant death syndrome.

laboratory completed this study, including the analysis of the tobacco-specific nitrosamines 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL), 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol-glucuronide (NNAL-glucuronide), and urinary 4-aminobiphenyl, in all participants at each time interval. Additional markers were measured at UCSF. As expected, the preliminary data suggested that "low tar and nicotine" cigarettes did *not* produce significant reductions in exposure to these hazardous components of tobacco smoke.

CDC Examines Prenatal Exposure to Tobacco and Risk for Sudden Infant Death Syndrome

Prenatal exposure to tobacco smoke increases the risk for sudden infant death syndrome (SIDS) by a factor of twofold to fourfold. CDC's environmental health laboratory designed a study to evaluate how prenatal nicotine exposure influences the newborn heart rate by continuously monitoring cardiac rates immediately after birth and relating the findings to cotinine concentrations in cord blood as an index of recent, prenatal nicotine exposure. Results indicated that infants with serum cotinine levels above a cutoff of 6 nanograms per milliliter (ng/mL) differed significantly from nonexposed infants (cotinine levels < 0.05 ng/mL) in maximum heart rate, range, and variance. Prenatal nicotine exposure accounted for 48% to 53% of the difference in the heart-rate variables. These findings indicate that newborns exposed prenatally to nicotine are less able to maximize their heart rate and thus their cardiac output during reduced inspirations, resulting in lower oxygen levels and putting them at higher risk for SIDS.

Tar, Nicotine, and Carbon Monoxide Levels in International Cigarette Brands Analyzed

Nicotine, tar, and carbon monoxide (CO) were considered for many years to be good markers for the addictiveness (nicotine), carcinogenicity (tar), and toxicity (CO) of tobacco smoke. Although scientists now know that evaluating tobacco smoke requires more sophisticated analysis, these substances are still the primary markers of the dangers posed by using tobacco. During the last year, CDC laboratorians measured nicotine, tar, and CO smoke yields from 77 cigarette brands purchased in 36 countries. The goal of this study was to compare these yields in mainstream smoke from cigarettes manufactured by a leading U.S. transnational corporation with

CDC Collaborates with Manufacturers to

address this problem, CDC is working to establish a system for obtaining consistent and uniform results across methods and sample matrices when measuring these markers. In 2001, CDC scientists completed development of a highly accurate, specific, and sensitive urinary method to measure two biomarkers, pyridinoline and deoxypyridinoline, that are used to manage bone diseases, such as osteoporosis, and to assess bone metabolism in epidemiologic studies. Currently, CDC's environmental health laboratory is the only place in the world where these markers can be measured with such accuracy.

Age-Related Vision Loss

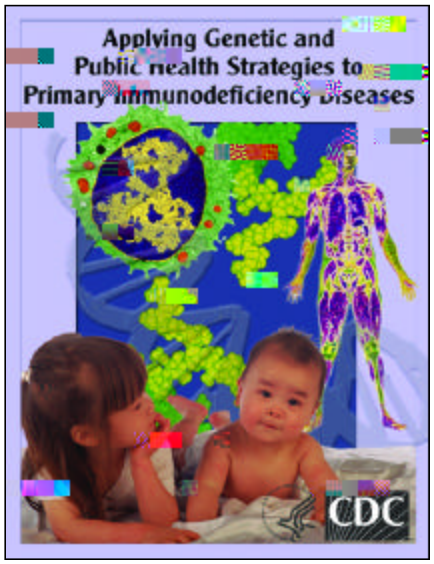
Antioxidant Vitamins and Zinc Reduce Risk for Age-Related Vision Loss Believing that visual impairment is unavoidable as they get older, many people are unaware that they are simply at risk for age-related vision loss. Moreover, results from an 11-year clinical trial show that a high-dose combination of vitamins C and E, betacarotene, and zinc could reduce that risk. Since 1990, CDC, in collaboration with the National Eye Institute (NEI), has participated in a major clinical trial called the Age-Related Eye Disease Study. This randomized, placebo-controlled trial of nutritional supplements for preventing macular degeneration involved 4,757 participants aged 55 through 80 years in 11 clinical centers nationwide. Study participants were given one of four treatments: (1) zinc alone, (2) antioxidants alone,3.2Rne and

In an 11-year study involving 4,757 participants, CDC and the National Eye Institute demonstrated that taking a high-dose combination of vitamins C and E, betacarotene, and zinc can reduce a person's risk of experiencing age-related vision loss.

health laboratory also piloted a proficiency-testing (PT) program for detecting disorders

Newborn Screening

Tandem Mass Spectrometry Signals Big Changes for Newborn Screening The ability of tandem mass spectrometry (MS/MS) to scan a single sample for a large group of inherited disorders promises to change the way newborn screening is done in the near future. Using this technology, laboratories can detect more than double the number of metabolic disorders than can be detected using other dried–blood-spot technologies alone. Advocacy groups are strongly urging the use of this technology, arguing that MS/MS can detect a wide variety of devastating conditions and that affected children have a better chance of survival through detection and early intervention. This year, CDC issued recommendations and guidance aimed at helping newborn screening programs implement and use this technology. CDC's environmental



An international conference convened by CDC focused on immunodeficiency diseases caused by single-gene disorders.

paper have improved performance of the device and its acceptance for use in a variety of assays.

Quality Ensured for Newborn Screening Tests CDC's Newborn Screening Quality Assurance Program ensures that newborn screening services provided by participating laboratories are accurate and of the highest quality. In the past year, 256 laboratories in 46 countries participated in external quality assurance (EQA) activities for inherited metabolic disorders. Forty-nine new participants, including the Ukraine, Luxembourg, Colombia, Turkey, and Denmark, were enrolled in the EQA program. This program provides a check for laboratories, giving immediate feedback to those who misclassify specimens so that they can take timely corrective action. Through close interaction with screening laboratories, CDC helps to ensure that affected babies are correctly identified, cases of disease are not missed, and the number of false-positive test results is minimized. CDC is the sole provider of comprehensive EQA services for newborn screening. In fiscal year 2001, CDC expanded the program to include EQA services for an additional 20 disorders that screening programs can detect using new technologies.

Primary Immunodeficiency Diseases Get Public Health Scrutiny To identify emerging targets for prevention research, CDC convened an international conference on immunodeficiency diseases caused by single-gene disorders. Attendees reported that children born with severe combined immunodeficiency disorders (SCIDs) can be rescued from early death by new interventions, such as stem-cell transplants (from donor bone marrow or umbilical cord blood) and gene-replacement therapy. Effective intervention must begin during the first few months of life while immunity transferred from the mother still protects the baby. Attendees also called on CDC to investigate newborn screening for SCIDs because of this narrow window of opportunity and the invariably fatal outcome of untreated disease. CDC identified candidate tests and is evaluating their technical feasibility.

Blood Spots from Newborns Used to Test for Diabetes Risk During 2001, scientists supported by CDC tested dried blood spots obtained from more than 10,000 newborns in Washington State to identify a cohort at higher risk than other newborns for type 1 diabetes. The dried blood spots had been collected for newborn screening and stored by the Washington State Department of Health, making this the first time that samples from a newborn screening repository were used for diabetes research. CDC also collected 12,000 dried blood spots from other people with known genetic risk factors to use as reference materials. Using these materials, CDC designed a proficiency-testing program involving six diabetes research centers in Europe and the United States. The purpose of the program is to help ensure the equivalency of performance in all centers that conduct diabetes research. The program will be expanded to additional centers that undertake similar population-based studies on type 1 diabetes.

Environmental Health Studies

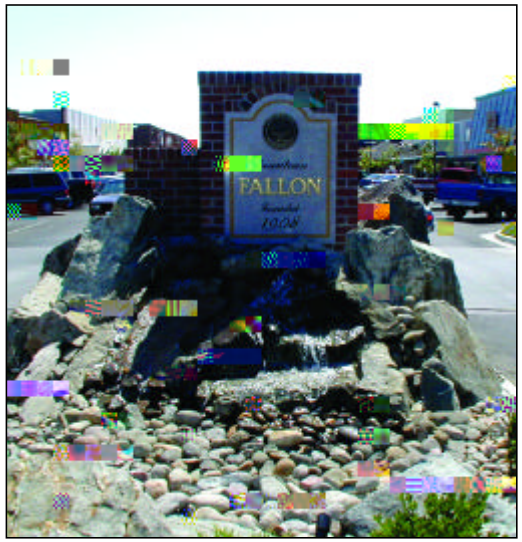
CDC Investigates Nevada Cancer Cluster In February 2001, the health officer for the state of Nevada reported a statistically significant increase in the incidence of acute lymphocytic and myelocytic leukemia (ALL/AML) in Churchill County. Local residents had expressed concern about pesticides applied to agricultural fields, pesticide run-off from these fields to irrigation ditches in which local children swim, arsenic in drinking water, and jet fuel used at the Fallon Naval Air Station. Fifteen children were diagnosed with ALL or AML from 1997 through 2001; for the previous decade, the expected rate of occurrence for the illness was 2.4 cases per 100,000 children, or one case every 5 years.

The Nevada State Health Division asked CDC to evaluate risk factors or etiologic exposures linked to this cluster of childhood leukemia and to design and conduct a cross-sectional exposure assessment of selective contaminants using environmental and biologic specimens collected from the case families and a reference population. The Agency for Toxic Substances and Disease Registry (ATSDR) was also asked to conduct an exposure-pathway assessment.

From August to November 2001, CDC operated a field office in Fallon, Nevada, that was equipped with a temporary laboratory facility that allowed precise aliquoting of blood and urine samples prior to shipment to CDC's environmental health laboratory. Staff from the Nevada Division of Environmental Protection coordinated field teams to collect environmental samples from study subjects' current and previous residences. Samples were collected from more than 130 homes and from approximately 200 people, including case children, their parents, and their siblings as well as from reference children and their parents.

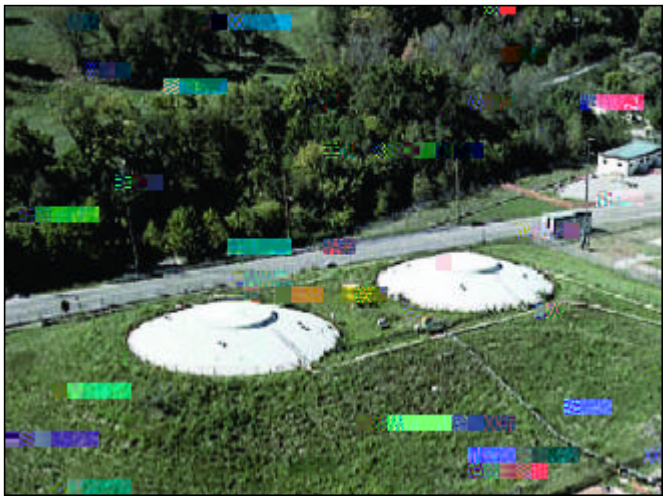
In December 2001, CDC began analyzing questionnaire, biologic, and environmental data. CDC scientists will assess chemical and radiologic exposures among participating children and their families. CDC's environmental health laboratory is analyzing urine and blood samples for the presence of 132 chemicals and is also measuring levels of 15 volatile organic compounds in the blood of the affected children and their families. CDC laboratory scientists will assess variations in genes involved in metabolizing toxic substances and any DNA repair occurring as a result of environmental exposures. CDC scientists will also extract DNA from blood and buccal cells and store it for future studies.

A statistical analysis group formed within CDC began refining an analysis plan that includes cross-sectional analysis for exposure assessment and a comparison of case and control data. CDC is working with ATSDR to use geographic information system technology to map the locations of study subjects' homes and of possible points of contamination to determine likely exposure routes. A committee comprising representatives from CDC and ATSDR, the United



The small town of Fallon, Nevada, is the site of an intense investigation into the causes of a higher-than-expected number of leukemia cases among area children.

States Geologic Survey, the Nevada State Health Division, and the Nevada Department of



Silos 1 and 2 of Operable Unit 4 at Fernald, Ohio. CDC's assessment of health risk to the nearby communities found that radon from radium-containing wastes in these silos was the most significant source of radiologic exposure for the public.

several decades this site, which is the former Feed Materials Production Center, served as a uranium-processing facility for the U.S. nuclear weapons production complex. Since requested to do so by Congress in 1988, CDC has estimated off-site exposure to community members, conducted risk analyses of several types of cancer, and assessed the feasibility of conducting a scientifically sound epidemiologic study (subsequently determined not to be feasible). On the basis of the results of a dose reconstruction study, CDC determined that radioactive substances, including uranium, thorium, radium, and radon daughter products, migrated off site and exposed members of the surrounding communities. What was unexpected, though, was CDC's finding that radon released from radium-containing waste stored on site—not uranium—created the most significant radiologic exposure for the communities surrounding the site. A CDC assessment of risk from these exposures concluded that the number of lung cancer deaths in the assessment population may increase by 1% to 12% as a result of exposure to radioactive material released from the site from 1951 through 1988.

CDC shared with community members information from risk analyses about potential health effects from off-site exposures. This information formed a basis for community seminars that the Agency for Toxic Substances and Disease Registry (ATSDR) developed. Although CDC has no future work planned in the Fernald community, CDC staff will continue to review research findings relating to health effects among community members and the possible links to the Fernald site. After consulting ATSDR, CDC discontinued its federally chartered advisory committee at the site this year.

Scientists Consider Public Health Consequences of Radioactive Fallout In collaboration with the National Cancer Institute, CDC scientists have prepared a report on the feasibility of conducting a study of the health consequences to the American people from radioactive fallout due to historic U.S. and global atmospheric nuclear weapons testing. For the first time, estimates have been made of preliminary doses and health risks from exposure to radioactive fallout from nuclear weapons tests conducted in the atmosphere from 1951 through 1962. This large two-volume report, which currently is undergoing department review, will

CDC's estimates of amounts of some hazardous materials released to air and water at the Savannah River Site (SRS), a U.S. Department of Energy site in close proximity to wetlands, agricultural land, and woodlands and underlain by an aquifer, are higher than those estimates previously provided by SRS.

undergo an extensive scientific peer review in fiscal year 2002. Congress and the Department of Health and Human Services will review the results of this feasibility study to determine whether the federal government should pursue a more comprehensive study of health consequences.

International Radiation Data to Be Made Available to Researchers A number of unintentional or operational releases of radioactive material to the environment have occurred at locations around the world. Radiation data compiled as a result of these events can be used in the development and testing of

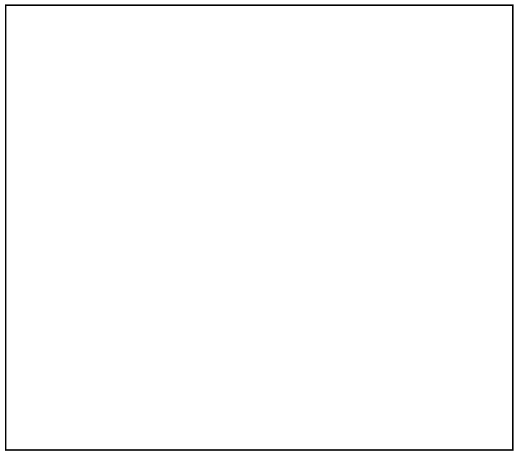
Agencies and Stakeholders Collaborate to Improve Advisory Committee Process

of the study is to determine if Vietnam veterans are experiencing any excess mortality compared with their nondeployed peers. Back in the 1980s, CDC conducted the Vietnam Experience Study, which assessed both mortality and morbidity of a cohort of U.S. Army Vietnam veterans and a comparison group of U.S. Army personnel who served at the time of the Vietnam War but who were not deployed to Vietnam. The original mortality component assessed mortality through 1983. This study will conduct a follow-up to determine mortality through 1999. Results are expected by the end of 2002.

Web Library to House Gulf War-Related Health Documents CDC provided $200,000 for the development of a Web-based research library of reports and articles about government-sponsored research on the health effects of military deployment during the Gulf War. The centralized library will be an easily accessible Internet tool designed to meet the needs of researchers, health care providers, veterans, and the general public. The library is being created through an interagency agreement between CDC and the Office of the Special Assistant to the Under Secretary of Defense (Personnel and Readiness) for Gulf War Illnesses, Medical Readiness, and Military Deployments. A workable Web site is expected to be completed in 2002.

Success Stories

CDC Reaches Out to MedicallyUnderserved Children with AsthmaCDC contracted with the Alliance ofCommunity Health Plans to theNational Cooperative Inner-City AsthmaStudy intervention in.2 clinics servingcommunities with medically underservedchildren who have



A CDC project identified two asthma intervention programs as science-based programs that are being successfully implemented at the community level to help children with asthma.

slated for intervention: access to primary care for asthma, adherence, behavior, and environment. The first 2 months of the intervention are semistructured, involving both group and individual sessions with child and family. Activities are then tailored to each family, focusing on environmental, medical, or special training, as needed. As the counselor tailors the intervention and learns of a family's specific circumstances, problems are often identified that can't be dealt with directly. The counselor refers these types of issues either back to the child's care provider or to another service that can address the problem. As the family begins participating in the tailored activities, the counselor maintains contact on a monthly basis throughout the intervention year, both by phone and in person. This contact enables the counselor to assess progress and provide continual reinforcement of key intervention concepts.

The asthma counselor at the El Rio Health Center worked with the University of Arizona Biomedical Center to create intervention tools in Spanish. Group and individual sessions are conducted in both English and Spanish. The project secured additional funding from nonfederal sources to purchase medications and to pay for pulmonologist visits, when indicated, for children with no insurance. To help the children and their families, the El Rio staff developed a notebook to record important telephone numbers and to keep track of medication refills and times to use the peak flow meter. The notebook also included instructions on how to determine whether a child with asthma symptoms should go to school.

The intervention was initially designed to include a role-playing component in the group training sessions. However, because the population served in this location was not comfortable engaging in role-playing, the counselor had helpers act out scenarios for the clients to watch. This enabled participating families to learn and discuss the role playing as a group and to benefit from this interaction without feeling pressured to participate. Children in the project are given awards for responsible behavior rather than for attendance at meetings. A $20 gift certificate is awarded to children who take their medications and use their peak flow meters as prescribed by their individual asthma management plans. Parents report that their children have never been so good about taking their medications. Children participating in the project have learned so much and enjoyed the program to such an extent that the asthma counselor has set up an extra "reunion" session for the children to see their new friends and catch up on each other's progress.r than forThe asthma counselor Tw (worked v

From Science to Intervention: Determining What Works for Asthma Across the country, people and organizations are searching for ways to prevent the rising rates of asthma in their communities. Asthma's impact is especially felt in the poorest inner-city areas. In 1999, CDC initiated action to identify science-based asthma interventions that could be replicated in a variety of community settings and to share this information at the state and local levels. CDC engaged the services of a contractor to (1) search the literature for research studies on asthma and (2) follow up with principal investigators to find out which studies actually had been implemented in hospital, clinic, school, or other community-based settings. The contractor discovered that despite the fact that many successful asthma research studies have been conducted over the past decade, only two have made a successful transition to an implemental intervention—Open Airways for Schools, prepared by the American Lung Association, and Asthma Care Training for Kids, a program from the Allergy and Asthma Foundation of America.

Finding out how few fully translated interventions were available was significant because it helped CDC better formulate its program activities for fiscal year (FY) 2001 and better understand the complexities of implementing successful asthma interventions at the community level. CDC used the knowledge it gained to contract for the translation of two more research study models in FY 2001. CDC also provided $941,000 to fund seven local organizations, including hospitals and schools, to implement Asthma Care Training for Kids and Open Airways for Schools. CDC shared the results of this effort with the National Asthma Education and Prevention Program, which is under the auspices of the National Heart, Lung, and Blood Institute and is the lead federal agency for coordinating efforts in asthma control. This year, CDC is updating its literature search, speaking to asthma experts across the country, and revising its inclusion criteria in an effort to identify more research models that may have been missed and to consider existing interventions which, although they may have not been based on research studies, warrant consideration on the basis of their0.0o9 ac06r Tc 1Tc 0rmulai workisingCDexistute ls itnsiday ices of the complex. Th
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The *National Report on Human Exposure to Environmental Chemicals* revealed levels of 27 chemicals measured in a sample of people in the United States.

environment. But the critical point is that these chemicals were measured in *people*, not in air, water, soil, or food.

Some of the measurements told us that levels of certain chemicals, such as cotinine, a marker for exposure to tobacco smoke, had gone down by a dramatic 75% since they were last measured during the period from 1988 through 1991; however, 24 of the chemicals (metals, organophosphate pesticides, and phthalates) listed in the *Report* had never been measured before in the U.S. population. The *Report* also established reference ranges for these 24 chemicals, documented the continued decline of blood lead levels among children since levels were measured during the period from 1991 through 1994, provided a better assessment of children's and women's exposure to mercury than was previously available, and helped to set priorities for additional research on phthalates.

The *Report* provided information from the National Health and Nutrition Examination Survey (NHANES), CDC's ongoing national survey of the general U.S. population. NHANES is unique in its ability to examine public health issues that can best be addressed through physical and laboratory examinations of the U.S. population. This first *Report* was restricted to general population data from NHANES for 1999.

CDC scientists have been measuring chemicals in people for at least 25 years, both for national studies of population exposures and for studies to examine exposures of specific populations. The work of these scientists has ranged from assessing exposures that resulted in acute disease or death to assessing those exposures that
defects, neurologic deficits, or other chronic diseases or conditions. CDC scientists also anticipated the need to measure levels in people exposed to unknown chemical agents that might be used by terrorists, and they have been working with state partners to increase the states' capacity to respond to these kinds of threats.

The success of the first *Report* is a direct result of the exceptional dedication, scientific acumen, and visionary work of hundreds of people in the laboratory doing their "ordinary" jobs to protect public health every day—around the clock, if needed. These scientists have a keen and abiding interest in discovery and innovation and a determination and sense of urgency to persevere until they "get it right." And they did.

Launched simultaneously through the National Center for Environmental Health's Web site and at a Washington, D.C., meeting with CDC's partners, the *Report* received close scrutiny by public health advocates and industry and widespread coverage and requests for interviews by national print and broadcast media. This coverage generated hundreds of requests for information from health care professionals and lay audiences worldwide.

Public Health Emergency Response

nvestment in the National Pharmaceutical Stockpile Program Proves Invaluable After Terrorist Attacks Established by CDC 2 years

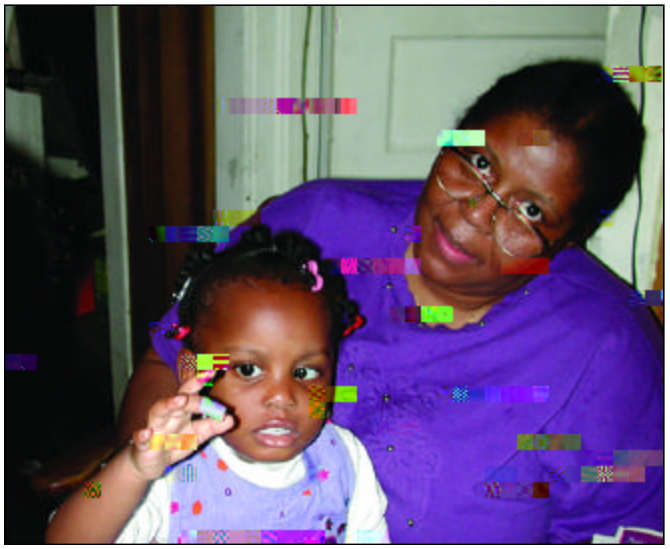
Established by CDC 2 years ago, the National Pharmaceutical Stockpile evolved from the need for America to establish a lifesaving, highly mobile resource to respond to a national terrorist attack.

the mayor's office. When the push package arrived at 10:00 PM, members of TARU met it and helped public health and emergency personnel rapidly procure, transport, and stage NPS assets. NPS Program staff also arranged for rapid delivery of more than 60 loads of vendor-managed inventory (VMI) to New York City. VMI packages, which contain drugs and medical supplies like push packages but which can be tailored to a specific situation, began arriving in New York City within 12 hours of the official request.

During the crisis, the NPS Program was responsible for the delivery of thousands of pounds of drugs, supplies, and protective equipment for victims and rescue workers. Only 2 years old, the NPS Program had been tested in a real-life terrorist attack. By all accounts, it passed with flying colors.

Childhood Lead Poisoning Prevention

High-Intensity Targeted Screening Exemplifies Effective Collaboration Between CDC, Communities, and Key Organizations CDC has made a commitment to eliminate childhood lead poisoning in the United States by 2010. Reducing blood lead levels (BLLs) to less than 10 µg/dL of blood is a tall order, requiring CDC to rapidly identify and follow up on large numbers of high-risk children. How can such a feat be accomplished? One way is by teaching states how to conduct high-intensity targeted screening (HITS) on a door-to-door basis. CDC's Lead Poisoning Prevention Branch completed the first HITS project in two inner-city communities in Chicago in November



One of the 581 inner-city Chicago children whose blood lead levels were measured in CDC's High-Intensity Targeted Screening project. The project was a collaborative effort among CDC and other federal, state, and local agencies.

2001. CDC's environmental health laboratory trained 20 teams (comprising 100 Chicago Department of Public Health staff members who worked in lead poisoning prevention) in the proper way to collect and analyze blood lead samples. CDC also assembled sample kits for each of the 20 teams and provided technical assistance and advice in the field. This first HITS project was a collaborative effort among CDC, the Chicago Department of Public Health, the Illinois Department of Public Health, the Department of Housing and Urban Development, the U.S.

Environmental Protection Agency, and the Centers for Medicare and Medicaid Services.

CDC selected the two communities—Austin and Englewood—for two reasons: (1) their rates of elevated BLLs were among the highest in the nation and (2) the Chicago Lead Poisoning Prevention Program (CLPPP) wanted to determine whether it was identifying and screening all high-risk children.

During the 3-week project, CDC assisted with study design, provided laboratory support, and collected and analyzed data. Americorp workers, community members, staff from the Chicago Department of Public Health, and graduate students from Emory University's Rollins School of Public Health conducted door-to-door screening. The Westside Health Authority and the Englewood Neighborhood Health Center provided the base of operations from which project participants worked.

Blood samples were collected from 581 children 12 to 71 months of age. The families of the tested children received educational materials, and when children were identified with elevated BLLs, the families were offered appropriate medical management and a home investigation to identify all possible sources of lead exposure.

The director for CLPPP declared that the Chicago HITS project was a success because it had forged partnerships and stimulated community interest in eliminating lead poisoning among children. CLPPP plans to use HITS data to improve screening plans, better direct resources, and monitor progress toward eliminating childhood lead poisoning. At least two more HITS projects are planned elsewhere in the nation in 2002. The methods developed by the Chicago HITS project can be replicated by other communities that want to collect representative baseline data in their efforts to eliminate childhood lead poisoning.

Environmental Health Services

***Protocol for Assessing Community Excellence in Environmental Health* Goes International** With a precedent-setting project in South America, CDC debuted in an international setting the successful *Protocol for Assessing Community Excellence in Environmental Health* (PACE-EH). PACE-EH was developed by the National Association of County and City Health Officials with funding from CDC. Through the CARE-CDC Health Initiative, both agencies helped build local capacity in public and private sectors to conduct community-based environmental health assessments in two Peruvian communities. The project collaborators used PACE-EH in planning and conducting the environmental health assessment activities, making the s used d914 Tw

CDC and CARE are teaching communities in Peru to use the *Protocol for Assessing Community Excellence in Environmental Health* to address public health issues such as drinking water supply. Here, children draw water from a public well while staffers discuss the issues.

evaluating local health conditions and concerns,
(2) identifying their environmental health risks
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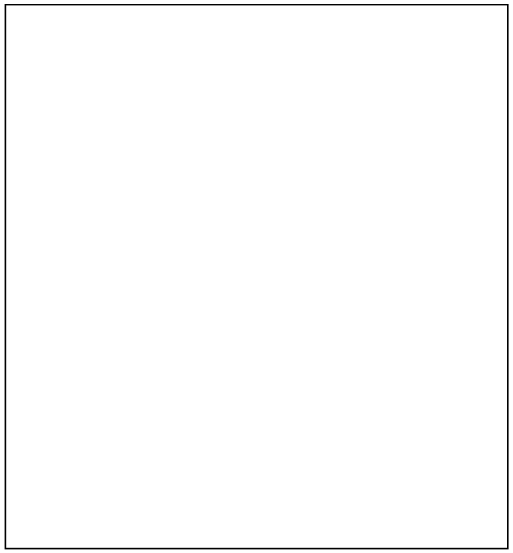
Key Research Findings

Asthma Death Rates Increase Among Elderly White Females Although death rates for asthma increased between 1979 and 1997, analyses to determine the demographic subgroups most affected by the increase have not been conducted. In response to this need, CDC used Underlying Cause of Death files for 1979 through 1995 to calculate annual and age-, sex-, and race-specific death rates. The results showed that deaths from asthma increased from 2,603 in 1979 to 5,645 in 1995. In the single variable analysis, rates of asthma mortality increased more in people older than 65 years of age than in younger people, in women more than in men, and in African-American women more than in white women. When considering age, sex, and race simultaneously, the single subgroup that accounted most for the increase in asthma mortality was white women aged 65 years and older. Subgroup characteristics are important considerations when interventions are planned and outcomes are assessed.

Moorman JE, Mannino DM. Increasing U.S. asthma mortality rates: who is really dying? J Asthma 2001;38(1):65–71.

Olympic Games Provide Insight on Traffic, Air Quality, and Asthma Control Although ozone and particulate pollution are associated with transient increases in asthma morbidity, the impact of citywide transportation changes on air quality and childhood asthma has not been studied. The alternative transportation strategy implemented in Atlanta during the 1996 Olympic games provided an opportunity to conduct such



Health effects of exposure to pesticides were examined in three CDC studies: one on premature births and pesticide metabolites, one on pesticide metabolites found in children's bodies, and one on pesticide metabolites found in the meconium of newborns.

tenfold margin of safety be applied in setting tolerances for pesticide use and that aggregate and cumulative exposures be considered to ensure that infants and children are adequately protected from exposure through chemical residues or other sources.

Fenske RA, Lu C, Barr DB, Needham LL. Children's exposure to chlorpyrifos and parathion in an agricultural community in central Washington state. Environ Health Perspect 2002. In press.

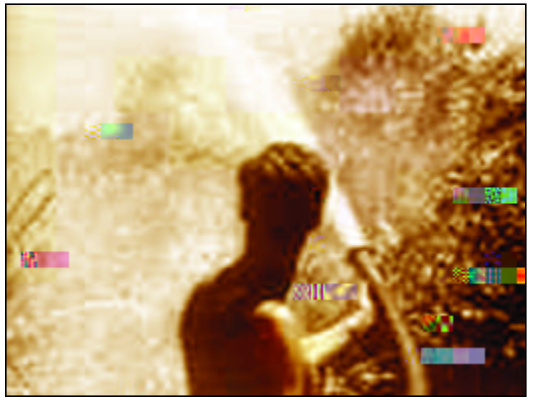
Whyatt RM, Barr DB. Measurement of organophosphate metabolites in postpartum meconium as a potential biomarker of prenatal exposure: a validation study. Environ Health Perspect 2001;109:417–20.

Additional Health Consequences of Exposure to Dioxin Found During fiscal year 2001, CDC scientists continued their efforts to link exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin to adverse health effects in people. Studies completed in 2001 show a statistically significant association between levels of dioxin and breast cancer among women who were exposed to dioxin after a major explosion in a chemical plant in Seveso, Italy, in 1976. Dioxin persists for a long time in the body, and CDC's environmental health laboratory has the ability to measure dioxin exposure in human samples many years after that exposure has occurred. In another study, CDC, in collaboration with the Department of Veterans Affairs, measured dioxin concentrations in veterans who served in Vietnam in the U.S. Army's Chemical Corps and sprayed Agent Orange, a dioxin-containing defoliant, from backpacks. CDC determined that the dioxin concentrations found in recently collected serum from veterans who served in Vietnam more than 30 years ago can be used to identify exposure variables for a health survey of exposure to phenoxyherbicides, which contain dioxin. The Department of Veterans Affairs will now determine whether to conduct the health survey.

Warner M, Mocarelli P, Eskenazi B, Samuels S, Gerthoux PM, Needham LL, et al. Serum dioxin concentrations and breast cancer risk in the Seveso Women's Health Study. Environ Health Perspect. In press 2002.

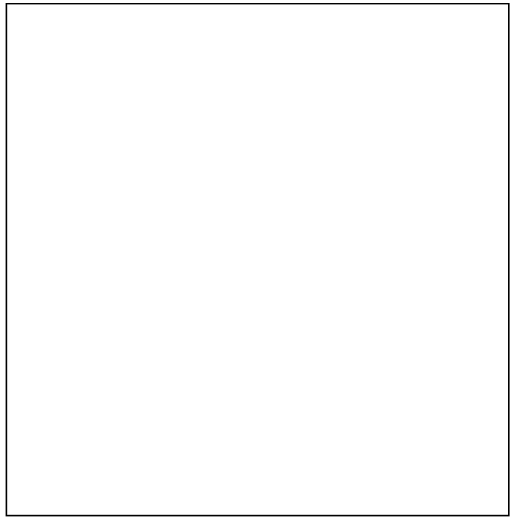
Kang HK, Dalager NA, Needham LL, Patterson Jr DG, Matanoski GM, Kanchanaraksa S, et al. U.S. Army Chemical Corps Vietnam veterans' health study: preliminary results. Chemosphere 2001;43:943–9.

CDC Collaborates with Denmark to Study *In Utero* Exposure to Polychlorinated Biphenyls and Mercury Several environmental pollutants are neurotoxic and may cause adverse developmental effects after *in utero* exposure. In the early 1990s, children born in the Faroe Islands of Denmark were thought to have been excessively exposed to polychlorinated biphenyls (PCBs). CDC, working with Danish investigators, analyzed PCBs and chlorinated hydrocarbon pesticides in the umbilical cords of these children. As part of this continuing collaboration, CDC is now assessing fetal exposures to PCBs and mercury and their relation to 17 neuropsychological outcomes that are determined when children reach 7 years of age. One recent finding was that



A soldier sprays Agent Orange, a dioxin-containing defoliant, in Vietnam. In 2001, CDC (1) measured dioxin concentrations in serum collected recently from Vietnam veterans who sprayed Agent Orange from backpacks and (2) studied women who were exposed to dioxin after a chemical plant explosion in Italy.

PCB exposure alone did not account for adverse health effects seen during the extensive neurobehavioral and cognitive testing of these children. However, PCB-associated deficits were found in those children with the highest levels of exposure to mercury. Additional studies are ongoing to help resolve this important issue.



Elevated blood levels are found more often in children who live in housing built before 1950, when lead-based paint was still being used.

departments in planning lead exposure screening strategies and in measuring program performance.

Reissman DB, Staley F, Curtis GB, Kaufmann RB. Use of geographic information system technology to aid health department decision making about childhood lead poisoning prevention activities. Environ Health Perspect 2001;109(1):89–94.

CDC Develops Recommendations to Ensure that Children Enrolled in Medicaid Undergo Blood Lead Screening Because children who live in low-income families are at higher risk for lead poisoning than other children, federal law requires states to screen children who are enrolled in Medicaid for elevated BLLs through the Early and Periodic Screening, Diagnosis, and Treatment Program. However, national data collected from NHANES III (1991 through1994) show that only 19% of children aged 1 to 5 years and 21% of children aged 1 through 2 years who were enrolled in Medicaid had received a blood

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Children living near a metal-processing plant in Torreon, Mexico, were studied by CDC to determine their blood lead levels. Blood lead levels in these children were higher than in U.S. children but lower than in children studied in other communities where smelting operations had not yet been remediated.

are considerably higher than the geometric mean found among U.S. children, which in the early 1990s was 2.7 µg/dL for children 1 through 5 years of age. The percentage of children in the U.S. population with BLLs ≥ 10 µg/dL is 4.4%. A noteworthy point is that although mean BLLs and the percentage of children with elevated BLLs found in this study were higher than those levels observed in the United States, they were lower than those observed in previous studies of children in other communities (such as in British Columbia and Quebec, Canada) where smelting operations had yet to undergo remediation.

Letters were sent to households to inform parents of the results of their children's tests and of the environmental sampling. In these letters, parents whose children had BLLs ≥ 20 µg/dL were encouraged to seek confirmatory blood tests; parents of children with levels ≥ 45 µg/dL were asked to take their children to their health care provider for immediate follow-up. The costs of any needed medical treatment are to be covered by a trust set up by the metal-processing company.

CDC recommended that the community not only continue to monitor lead emissions and dust and soil levels in the areas around the processing plant but also target educational interventions to reduce lead exposure in Torreón children.

CDC. Blood lead levels and risk factors for lead poisoning among children in Torreón, Coahuila, Mexico. Final report. Atlanta (GA): Dept. of Health and Human Services (US), Centers for Disease Control and Prevention; 2001.

Genomics

CDC Publishes First-Ever Nationally Representative Prevalence Data for Hemochromatosis Genes Scientists have taken a big step forward in helping to answer questions about hereditary hemochromatosis, the most common genetic disease in the United States. This genetic disease causes people to absorb excess amounts of iron from their diet that then accumulates in organs such as the heart, liver, and kidneys. This "iron overload" causes diseases such as cirrhosis and heart failure and in some cases, death. However, hemochromatosis can be prevented if detected early.

Hemochromatosis, an inherited disorder that causes people to absorb too much iron from their diet, is the most common genetic disease in the United States. CDC studied the prevalence in the white U.S. population of two gene mutations that, if inherited together, predispose a person to hemochromatosis.

CDC published the first population-based estimates of gene variants that are associated with hereditary hemochromatosis in the white U.S. population. These rare gene variants that predispose people to hereditary hemochromatosis are called *C28Y* and *H63D*. People in the white population who inherit two copies of one of these variants, or one of each of the variants rather than the normal form of the gene, will be susceptible to iron overload. In the United States, 5.4% of the population has at least one copy of the *C28Y* variant, and 13.5 % has at least one copy of the *H63D* variant.

This study revealed that other gene variants must be found to account for the disease among African-American and Hispanic populations. Information about the prevalence of gene variants associated with the disease and the penetrance of these variants is critical for making public health decisions about genetic screening for this disease.

Steinberg KK, Cogswell ME, Chang JC, Caudill SP,

and outcomes data. Public health agencies need strategic planning to take advantage of the opportunities associated with the development and implementation of genetic tests and procedures.

Piper MA, Lindenmayer JM, Lengerich EJ, Pass KA, Brown WG, Crowder WB, et al. The role of state public health agencies in genetics and disease prevention: results of a national survey. Public Health Rep 2001;116:22–31.

International Health

Measles Is a Significant Contributor to Mortality in Ethiopian Famine While assisting the United Nations Children's Fund (UNICEF) with coordinating a famine relief effort in Ethiopia, CDC staff and the United States Agency for International Development's Office of Foreign Disaster Assistance jointly assessed famine-affected areas. A survey was designed and conducted to enable determinations to be made about nutrition and retrospective mortality in the Gode district, the epicenter of the famine. In addition, a database was designed that collated information from nutrition surveys conducted by all UN agencies and nongovernmental organizations (NGOs) in famine-affected areas of Ethiopia. CDC's activities helped standardize survey methods and improve the standards of feeding programs operated by UN agencies and NGOs. The Gode survey highlighted the region's ongoing nutritional crisis and the fact that measles contributed to mortality. The findings illustrated the need to extend measles vaccination coverage to children between 5 and 14 years of age. The CDC article published in the *Journal of the American Medical Association* as a result of this research was one of the first to demonstrate epidemiologically the potential negative effects of a humanitarian response that is not based on sound knowledge of public health principles. The article received widespread coverage among the media and led several UN agencies to review their policies and practices. UNICEF has since asked CDC to collaborate with Columbia and Tufts universities to establish worldwide training for UNICEF staff in emergency response. Furthermore, UNICEF is prioritizing measles vaccination as a major activity. As a result of the CDC article, the target age group for measles vaccination is now widely accepted as being up to 15 years.

Salama P, Assefa F, Talley L, Spiegel P, van der Veen A, Gotway CA. Malnutrition, measles, mortality, and the humanitarian response during a famine in Ethiopia. JAMA 2001;286:563–71.

Surveillance for Human Immunodeficiency Virus Lacking in Complex Emergencies Research by CDC has shown that despite recent success in preventing human immunodeficiency virus (HIV) infection in stable populations in selected developing countries, internally displaced persons and refugees have not been

methods—such as cross-sectional, population-based surveys—can provide rapid information on HIV, sexually transmitted infections (STIs), and sexual behavior, though the risks of stigmatization and breaches of confidentiality presented by second-generation methods must be recognized. On the basis of CDC's research, which was published in the journal *AIDS*, surveillance is required to define the high-risk groups and to target interventions. Such surveillance will ultimately decrease HIV and STI transmission within countries facing complex emergencies as well as facilitate regional control of HIV epidemics.

Salama P, Dondero T. HIV surveillance in complex emergencies. AIDS 2001;15 Suppl 3:S4–S12.

Improving the Diagnosis, Treatment, and Prevention of Chronic Diseases

Tobacco-Related Issues

Latino Tobacco Workers' Risk of Getting Green Tobacco Sickness Studied Dermal exposure to nicotine by tobacco workers is known to be associated with a form of nicotine poisoning called green tobacco sickness (GTS). In recent years, tobacco work has been performed mainly by migrant workers, almost all Latino, who have little experience with tobacco production and are often unaware of their risk of developing GTS. This study examined a cohort of 182 workers in North Carolina during the summer of 1999. Repeated salivary cotinine measurements obtained over the course of the season demonstrated that these workers experienced substantial work-related exposure to nicotine. The analyses indicated that exposures varied greatly by activities, with "priming" or harvesting of tobacco associated with the greatest exposure risk. The analyses also helped identify work behaviors that might mediate the risk for exposure.

These results are being used to develop educational materials for workers to help them avoid exposure and thus decrease their risk of developing GTS. In addition, a follow-up case-control study is in progress of workers who did and who did not develop GTS.

Quandt SA, Arcury TA, Preisser JS, Bernert JT, Norton D. Environmental and behavioral

laboratories that participate in CDC's PT program, CDC scientists observed an extremely unusual result for the metabolite octanoylcarnitine: the recovery was significantly lower than that for other acylcarnitines. To account for this discrepancy and prevent it from recurring, CDC scientists designed experiments to clarify and confirm the loss of D, L-octanoylcarnitine and found that using a racemic (equimolar) mixture of D, L-octanoylcarnitine to calibrate assays results in overestimating the concentration of octanoylcarnitine in routine blood-spot

Mothers who had recently given birth were studied by CDC in Georgia and Texas to determine levels of water disinfection by-products in their blood before and after they took a shower.

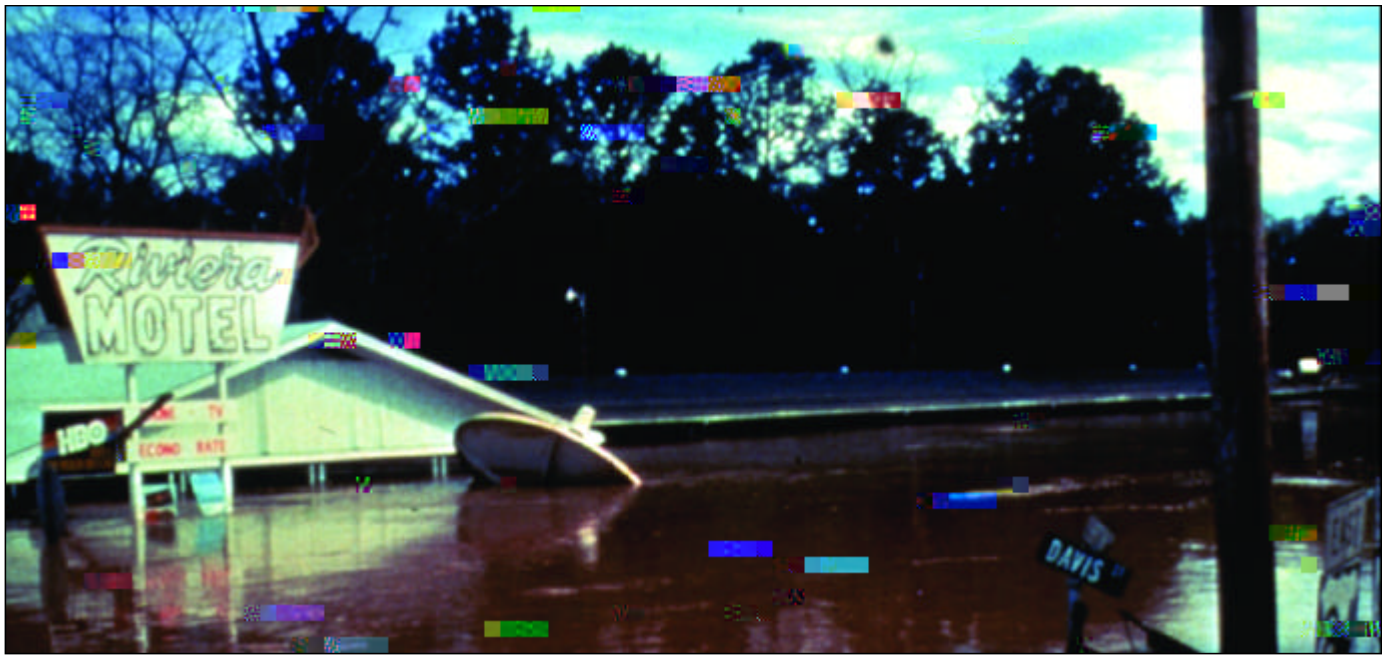
to high-frequency sound discrimination difficulties. The hearing loss may be subtle but can contribute to problems with classroom learning. This kind of hearing loss is characterized by specific threshold shifts that can be observed during an audiogram. To determine the extent of this problem among U.S. children, CDC analyzed audiograms that had been performed as part of the National Health and Nutrition Examination Survey (NHANES) III, conducted from 1988 through 1994. A total of 5,249 children aged 6 to 19 years completed both audiometry and compliance testing for both ears as part of NHANES III. The criteria used to assess noise-induced threshold shifts included observation of a distinct audiometric pattern called a noise notch in at least one ear. Survey results indicated that of those children aged 6 to19 years, 12.5% (approximately 5.2 million) are estimated to have noise-induced hearing loss in one or both ears. These findings suggest that children are being exposed to excessive amounts of hazardous levels of noise, and children's hearing is susceptible to damage from these exposures. Results indicate the need for research on appropriate hearing conservation methods and for audiometric screening programs among school-aged children.

Niskar AS, Kieszak SM, Holmes A, Esteban E, Rubin C, Brody DJ. Estimated prevalence of noise-induced hearing threshold shifts among children 6-19 years of age: the third National Health and Nutrition Examination Survey, 1988–94—United States. Pediatrics 2001;108:40–3.

Disinfection By-Products in Tap Water Are Cause for Concern Recent epidemiologic studies of disinfection by-products (DBPs) have suggested an association between DBPs (generally trihalomethanes [THMs]) in tap water and adverse reproductive outcomes, including spontaneous abortion, birth defects, and intrauterine growth retardation. Although most studies of human reproductive outcome and exposure to THMs have focused on total THMs, recent epidemiologic studies that evaluated exposure to individual THM species found an increased risk of spontaneous abortion associated with exposure to increased levels of bromodichloromethane levels in drinking water. Both chlorinated and brominated THM species (including chloroform, bromodichloromethane, and bromoform) cause reproductive and developmental toxicity in laboratory animals; however, studies are not clear on which THM species pose the greatest potential health risk. CDC staff conducted a field study in 1999 in Corpus Christi, Texas, and Cobb County, Georgia, to evaluate exposure measures for DBPs, with a special emphasis on THMs. Participants were mothers living in either geographic area who gave birth to healthy infants from June 1998 through May 1999. The study assessed exposure by sampling blood and water and by obtaining information about water use habits and tap water characteristics. Because inhalation of aerosolized THMs while showering is considered to be one of the most important and significant routes of exposure, CDC staff collected two 10-mL whole blood samples from each participant before and immediately after her shower. Levels of individual THM species

Investigation of human health effects associated with potential exposure to genetically modified corn. Final report. Atlanta (GA): Dept. of Health and Human Services (US), Centers for Disease Control and Prevention; 2001.

Research Continues on the Possible Health Effect of *Pfiesteria piscicida* Since 1996, the public health effect of the presence of the dinoflagellate *Pfiesteria piscicida* in East Coast



Global climate change—which could cause natural disasters such as floods, droughts, and heat waves—was the topic of a literature review that CDC conducted to determine the potential effects on human health.

McGeehin MA, Rubin CH. *Pfiesteria:* from biology to public health. Environ Health Perspect 2001;109 Suppl 5:633–808.

Potential Impacts of Climate Change and Variability on Human Health Call for Preventive Measures and Additional Research

CDC reviewed the literature regarding the potential impacts of climate change and variability on human health. Findings included the following: (1) heat and heat waves are predicted to increase in severity and frequency with increasing global mean temperatures; (2) overall death rates are higher in winter than in summer, although the relation between winter weather and mortality is difficult to interpret; and (3) physiologic and behavioral adaptations, warning systems, and illness management plans may reduce morbidity and mortality from heat or cold. Additional research is needed to do the following: (1) identify critical weather parameters, (2) determine whether any association exists between heat and nonfatal illness, (3) evaluate the implementation of heat response plans, and (4) determine the effectiveness of urban design in reducing heat retention.

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