MCOHS ERC COMPREHENSIVE RESOURCES AND ENVIRONMENT

MIDWEST CENTER FOR OCCUPATIONAL HEALTH AND SAFETY (MCOHS)
UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINNESOTA

RESOURCES AND ENVIRONMENT

A wide variety of facilities and resources are available to the MCOHS that enhance the academic and research experience. Many of these are identified in the following:

University Financial Management and Oversight

The University of Minnesota has developed and maintained the most sophisticated grants and project management oversight system of any major U.S. research university. The approach clearly identifies the roles and responsibilities of various members of the University for elements of the grants application and management process. It establishes lines of authority within the University related to all transactions on sponsored projects. A key feature of the model is the decentralization of many of the responsibilities to the Principal Investigator level, with oversight and monitoring provided by department heads and deans. At the University level, management and oversight includes two organizations: 1) The Sponsored Projects Administration (SPA), an office reporting to the Office of Vice President for Research, has the authority to deal directly with both federal and non-federal funding agencies relating to any aspect of externally funded activity at the University of Minnesota. Sponsored Projects Administration signs all applications for funding and also accepts all awards on behalf of the University; and 2) The Office of Institutional Oversight (also under the Office of Vice President for Research) monitors and analyzes grant transactional activity to identify unusual activities, and to report problems to deans and department heads in order to implement resolutions. A fuller description of grants management at the University of Minnesota may be obtained from the website: http://www.ospa.umn.edu/.

Adjunct Educational, Research and Service Centers

Centers for Public Health Education and Outreach

The **Midwest Center for Occupational Health and Safety Continuing Education Program is** administratively housed in the **Centers for Public Health Education and Outreach** (CPHEO) which is an education and outreach unit of the University of Minnesota's School of Public Health (SPH). The CPHEO is housed on the University campus, within the SPH. In addition, offices, conference and planning rooms facilitate participation of a wide range of faculty and advisory groups. The CPHEO's mission is to promote lifelong learning to bridge academic and public health practice communities, including improvement of the capacity of the public health workforce to prepare for and respond to current and emerging public health needs. CPHEO's expertise, experience, and focus are well-suited to lead regional efforts to improve the public health system. CPHEO makes use of innovative technology, whenever possible, to meet the learning needs of a geographically dispersed audience of health professionals, public officials, and the general public. CPHEO is charged with coordinating professional training efforts across the School of Public Health, building the School's capacity for technology-enhanced learning, and expanding linkages with the community. CPHEO is the administrative home of five multi-disciplinary training initiatives that serve as a venue for delivery of innovative public health training and education.

Since 1987, over 200,000 participants have been trained through CPHEO's continuing education for public health practitioners and specialists in a variety of fields, including preventive medicine, public health, occupational health and safety, maternal and child health, nutrition, obesity prevention, and environmental health. The co-location of the CPEHO Centers, which include the Health Resources and Services Administration (HRSA) Midwest Center for Life-Long-Learning in Public Health, NIOSH Midwest Center for Occupational Health and Safety Continuing Education Program, and CDC Center for Preparedness and Emergency Response Learning Center, allows for synergy of resources and diminishes the potential for development of trainings that are duplicative in nature. CPHEO also serves as a bridge between the academic and professional communities, supporting options for learners seeking academic credentials, including executive leadership, dual-degree programs, and academic certificate programs. The SPH consistently ranks among the nation's top public health programs. It offers degree and certificate programs, continuing education and training, conferences, and research in a broad array of fields, providing substantial support for alternative learning opportunities that improve and maintain public health workforce competencies. The SPH's mission

includes generating scientific knowledge and applying that knowledge to improve population health, well-being, and disease prevention throughout the lifespan and preparing new generations of public health researchers and workforce practitioners. The School's academic divisions include Biostatistics, Epidemiology and Community Health, Environmental Health Sciences, Health Services Research and Policy. In addition to the academic structure, the School embraces outreach and service to the broader community as a core value.

The School also has substantial and growing experience in developing and implementing alternative learning opportunities in outreach to public health professionals. Continuing education offerings at the SPH are quite diverse and range from short courses, institutes, professional certification courses, workshops and conferences with credit and not-for-credit options. Every Division is actively involved in developing and offering education according to the workforce needs and intellectual interests of alumni, current students and professionals working in their respective fields. In addition to traditional degree and dual degree programs, the School provides health professionals with alternative learning opportunities to improve and maintain skills and competencies needed in the public health workforce. The SPH initiatives include a summer program covering the complete public health core for degree and non-degree seeking students as well as other courses across the MPH curricula. The School has made increasing use of web and other information technology to expand the learning opportunities for public health professionals. The CPHEO is specifically charged with accelerating this process.

The School of Public Health has experience in conducting conferences using satellite and web based capabilities to support access. The University provides high-speed Internet access (Ethernet, Fiber-Optic network) at its Twin Cities' and coordinate campuses in Crookston, Duluth, Morris, and Rochester, covering all quadrants of the state. The University is also a participant in the Internet2 project, which has significantly increased bandwidth and speed permitting full-frame video transmission and interaction via the WWW.

The SPH is part of the University of Minnesota's Academic Health Center (AHC), home to six health professional schools (Public Health, Veterinary Medicine, Nursing, Pharmacy, Dentistry, and Medicine) as well as several allied health programs, centers and institutes. The AHC prepares new health professionals who improve the health of communities, discover and deliver new treatments and cures, and strengthen the health economy. Collectively, the units comprising the AHC represent a significant concentration of expertise that can be activated to prevent, or respond to, a public health challenge.

Minnesota Center for Survey Research

The Minnesota Center for Survey Research (MCSR), housed in the Center for Urban and Regional Affairs at the University of Minnesota, provides survey research services to University of Minnesota faculty and administrators. This Center plays a central role in providing training, services, and advice about survey research for academic disciplines across the University. In 2013 MCOHS utilized MCSR to conduct online competency surveys for recent graduates of our ERC. In addition, MCSR uses a computer-assisted telephone interviewing (CATI) system that computerizes answers, allowing administrators to see preliminary results of a survey immediately.

Regional Injury Prevention Research Center (http://enhs.umn.edu/riprc/riprc.html)

This center was established to provide a multidisciplinary program for the prevention and control of injuries, including catastrophic and long-term disabling injuries, with attention to the rural environment. The overall goal of the Center is to develop injury control programs that will ultimately reduce mortality, morbidity, and disability from injury in rural and other areas using a comprehensive and integrated approach that incorporates research, education, and intervention efforts. This Center has been designated as a collaborating program with the Centers for Disease Control in Atlanta, since 1988, and was initially funded to conduct a major five state Regional Rural Injury Study - I (RRIS-I) in 1990, among numerous other research efforts; the RRIS-I provided baseline data on the total injury experience for agricultural household members in the five state region of Minnesota, Wisconsin, North Dakota, South Dakota, and Nebraska, and has served as the basis for numerous analytical efforts. The RRIS-II, in 1999, that addressed etiology and immediate consequences of injuries among children in farm households, provided the basis for a unique surveillance effort, initiated through the RRIS-II, Phase 2, in 2001. A recent effort (RRIS-III), that addresses consequences of agricultural injuries, serves as a basis for student and faculty collaborative research. Numerous other efforts conducted through the Center have addressed a variety of work-related injuries, including work-related violence, brain and spinal cord injury, sports injuries, work-related injuries among specific occupational groups, and various other efforts. The involvement of key states in the North Central American region lend great strength to important injury prevention and control efforts that address problems in rural and other regions.

United States Department Of Agriculture, Agricultural Statistics Service

The United States Department of Agriculture (USDA), Minnesota Agricultural Statistics Service (MASS) is housed in the Minnesota Department of Agriculture's facilities. They served as important collaborators in a five-state study of agricultural household interviews for the 1990 RRIS-I project, using a survey tool that included extensive information on the members of the agricultural household, identification of injured family members, specific information on injuries that occurred during the study period, and detailed information on the characteristics of the operation and relevant exposures. They were also involved in the 1999 and 2001 RRIS-II, study of etiology and consequences of injuries among children in farm households and surveillance efforts, respectively; 16,000 operations were initially interviewed in each year to acquire the eligible households with children. Data collected included demographic household information, relevant injury experience and initial consequences during the study period, for all household residents, and a nested case-control effort to identify specific risk factors for injuries among those children and youth less than 20 years of age. The most recent collaborative effort, to identify consequences of agricultural injuries among all ages – but, with a primary focus on youth in five Midwestern states (Minnesota, Wisconsin, North Dakota, South Dakota and Nebraska), was facilitated in collaborations with the USDA, National Agricultural Statistics Service (NASS), which now maintains calling centers for the nation that provide enhanced opportunities and efficiency in such studies.

Extension Services

The following information is pertinent to the state of Minnesota. However, comparable capabilities are also available in the Extension Services throughout the states in the region. *In particular, this is an excellent resource for translation of research to practice.*

As a major outreach arm of the University of Minnesota, the Minnesota Extension Service (MES) staff and volunteers coordinate and conduct research-based educational programs throughout each of the state's 87 counties; presentations, demonstrations, distance communication (e.g., satellite video transmission), publications, mass media interview and articles, computer programs, and one-on-one consultation facilitate their efforts. Approximately 260 MES county extension agents and 173 state extension faculty conduct educational programs and applied research focusing on current and future issues in five primary program areas: agriculture; 4-H youth development; home economics; community economic development; and natural resources. MES has one extension faculty member (including state faculty and country agents for every 10,000 citizens based on the total population of the state. The MES also includes the full-time-equivalents of approximately 360 support staff, representing a broad range of technical skills needed to help produce and deliver education programs in the counties and at the University. In addition, another 40,000 volunteers assist with program preparation, delivery, and ongoing identification of issues of community concern. MES has identified agricultural safety and health as an issue that must receive increased attention in future educational programming activities. Currently, educational programming related to health and safety is focused on youth safety in tractor and machinery operation and other production-related activities. The Extension Services in each of the states, identified in the current proposal, provide an excellent resource for dissemination of relevant information that can be generated from research to practice.

Center for Violence Prevention and Control (http://www1.umn.edu/cvpc/research.html)

This center is dedicated to the development and facilitation of interdisciplinary collaboration in research and graduate education efforts that can ultimately affect the prevention and control of violence. This mission is carried out by: 1) providing a comprehensive violence prevention and control graduate education opportunities; 2) generating knowledge through research in violence prevention and control; 3) disseminating this knowledge to use as a basis for development of prevention and control efforts. Research efforts cover the realm of violence-related problems, including: child maltreatment; domestic violence; alcohol-related problems; work-related violent victimization; and cost of violence.

Center for Environment and Health Policy

This Center is funded by grants from the US Environmental Protection Agency, Legislative Commission on Minnesota Resources, Minnesota Pollution Control Agency, Minnesota Offices of environmental Assistance, and the University of Minnesota. The Center has focused on two major areas: improving assessment, management, and communication of environmental health risks; and fostering better environmental policy decisions.

Upper Midwest Agricultural Safety and Health Center (http://umash.umn.edu/)

This NIOSH-funded Center for Excellence in Agricultural Disease and Injury Research, Education and Prevention is a collaboration between the University of Minnesota School of Public Health and the College of Veterinary Medicine, the Minnesota Department of Health, and the National Farm Medicine Center of the Marshfield Clinic. This was developed using a One Health model that integrates the health of humans, animals and the environment. The center is currently focusing on animal agriculture with projects that relate to disease and injury related to agricultural production.

The Intelligent Transportation Systems (ITS) Institute

This is a National University Transportation Center (UTC) funded through the Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU). The Institute plans and conducts activities that further the mission of the UTC program of the United States Department of Transportation (USDOT). That mission is to advance technology and expertise in the many disciplines that make up transportation through education, research, and technology transfer activities at university-based centers of excellence. To that end, the Institute brings together technologists and those who study human behavior to ensure that Institute-developed technologies become tools that optimize human capabilities. This human-centered approach means that new developments in the core ITS technology areas of computing, sensing, communications, and control systems will be used to approach significant safety and mobility problems with a fresh perspective.

The ITS Institute's primary human factors research laboratory to direct the human-centered approach is the Human Factors Interdisciplinary Research in Simulation and Transportation (HumanFIRST Program). This program supports the ITS Institute mandate "to enhance the safety and mobility of road and transit-based transportation through a focus on human-centered technology."

The HumanFIRST Program is comprised of a core staff of cognitive psychologists linked to a broader multidisciplinary network of researchers. The mission of this program is to become a center of excellence for human factors applied to the development of usable ITS applications to reduce crash fatalities. The program applies psychological theory and research methodologies to support a scientific understanding of driver performance and cognitive functions in relation to fatal traffic crashes. As implied by the name of the program, the research strategy will be based on a human-centered approach such that any problem definition or design specification will consider the "human first" within the transportation system. To ensure that this research considers developments on the world stage, these efforts are supported by international collaborative relationships with individuals and institutions with expertise in relevant disciplines.

Occupational and Environmental Medicine (OEM) Resources

The OEM Residency Program has access to all of the major venues of occupational/environmental medicine practice: academics; hospital-based practice; private practice; corporate practice; and government agency practice. The comprehensive training made available to residents involves their participation in the entire range of activities within occupational medicine. The community resource facilities include corporate national headquarter offices for General Mills and 3M, both of which have active occupational medicine departments, as well as the main administrative offices for several state governmental agencies. Each resident completes the equivalent of three months of core industrial rotations in the medical departments of participating Twin City-based national corporations. During industrial rotations, residents concentrate on the field evaluation and abatement of health hazards as part of multidisciplinary teams of Occupational Health and Safety professionals. Industrial rotation activities include site visits, problem-oriented research and evaluation of existing safety and health data, policy development and implementation, and health and safety program evaluation. There is also a mandatory rotation with Minnesota OSHA during which residents participate in the evaluation and implementation of safety and health regulations and multiple site visits. OEM residents spend four months in the initial year of training delivering OEM care to a wide mix of patients in the Regions Hospital OEM clinic and Riverside OEM clinic. The second training year has an ongoing longitudinal clinic for each resident. Also, each resident spend a month in the outpatient area for the University of Minnesota, Division of Critical Care, Allergy, Pulmonary and Sleep Medicine.

The OEM Program has well-established and formal relationships with participating corporations, which serve as the industrial rotations (notably, 3M Corporation, General Mills, Fairview Health Systems Employee Health, St Paul-Ramsey County Department of Health, and Regions Hospital Employee Health), Minneapolis Veteran’s Administration Hospital Employee Health as well as close ties with the Minnesota Department of Health and the Minnesota Department of Labor and Industry (including Minnesota OSHA). Residents gain administrative experience through their industrial rotations with 3M, General Mills, St. Paul-Ramsey County Department of Public Health and HealthPartners Workers Compensation Managed Care. The availability and

integration of these various experiences into a single program of training provides the OEM resident with a unique grasp of the field of occupational medicine.

Laboratory Facilities

The School of Public Health has 25,000 square feet classified as laboratory space, located in the Division of Environmental Health Sciences and the Division of Epidemiology. These laboratories and collaborating units are nationally recognized standardized service centers in the field. They are geared to ongoing surveillance and evaluation of community health experience and of the effects of health promotion programs.

Industrial Hygiene Laboratories:

The Industrial Hygiene Laboratory is located in Boynton Health Service, a building adjacent and connected to the Mayo Building. An additional room serves as a student office and is equipped with desktop computers and a wireless router. Altogether, the laboratory occupies approximately 2,500 sq. ft. and possesses instruments to characterize workplace hazards, including instrumentation for measurement of gases, vapors, and particulate matter, including biological aerosols. Space is available for laboratory teaching as well as student and faculty research. The IH Laboratory possesses a large wind tunnel, an exposure chamber, a filter testing apparatus, numerous laboratory hoods, a biosafety cabinet, and a flammable storage cabinet. The laboratory contains emergency stations, including two safety shower and three eye washes. For aerosol research and measurements, the Industrial Hygiene Laboratory has TSI Condensation Particle Counters for measuring nanoparticle counts, TSI Aerotrak Diffusion Chargers capable of measuring nanoparticle surface area concentrations, a TSI Aerodynamic Particle Sizer, a TSI Differential Mobility Particle Sizer, TSI DustTrak nephelometers for measuring aerosol mass concentrations, numerous gravimetric indoor and personal samplers, and portable size distribution measuring devices including a TSI Optical Particle Counter. In addition, the lab owns two MSP MOUDI impactors for size distribution analysis and several Andersen Cascade Impactors and Six-Stage Viable Samplers. To analyze filter samples, light and phase contrast microscopes are present. Equipment is available for generating different kinds of test aerosols. The Industrial Hygiene Laboratory owns equipment for gas and vapor sampling, including recently purchased real-time instruments for measuring ammonia and hydrogen sulfide concentrations. The lab also has other devices including charcoal tubes, diffusion badges, a Foxboro direct-reading FID/PID and calibration kit, and a Hewlett-Packard gas chromatograph with a flame ionization detector. The lab has equipment for calibration of the sampling instrumentation such as the Gilian calibrators, and a wide range of pumps for use with the various sampling devices, Dräger pumps and tubes, noise dosimeters, velometers, manometers, pressure gages, pitot tubes, and centrifugal fans for ventilation experiments.

Located on the 11th floor of the Mayo Building, the Division of Environmental Health Sciences Environmental Chemistry Laboratory facilities include greater than 600 square feet of laboratory space equipped with extraction and processing equipment for trace analysis of environmental samples. This laboratory is used for teaching IH students about chemical analyses of samples. The space includes three GC/MS, one LC/MS, a GC/ECD and a scintillation counter. The University of Minnesota Particle Technology Laboratory in the Department of Mechanical Engineering shares aerosol instruments with IH Program faculty and students for research projects. IH students have used the University of Minnesota Characterization Facility to analyze samples by electron microscopy. The University of Minnesota Veterinary Diagnostic Laboratory has collaborated with IH faculty on projects involving viral analyses. The Department of Physics Research shop has built multiple experimental systems for IH Program students and faculty.

Additional equipment is available from the Midwest Center for Occupational Health and Safety Continuing Education Program. Such equipment includes direct readings instruments and samplers for gases, vapors and aerosols, as well as personal protective equipment, including respirators, gloves, and suits for various levels of protection. This equipment is regularly maintained and calibrated. The University of Minnesota's Department of Environmental Health and Safety, which protects the health and safety of university employees, students, and neighbors, also shares equipment with the IH Program as needed. A large number of mechanical and electrical tools are available for assembling experimental apparatus.

Toxicology Laboratory (Dr. William Toscano, Director)

Located in the Mayo Memorial Building, the Toxicology Laboratory has ~ 1200 square feet. It is equipped with state-of-the-art tissue culture facilities, high-speed centrifuge, rotors, microfuges, speed vac, environmental shaker, visible and UV spectrophotometer, fluorimeter, luminometer polymerase chain reaction (PCR), liquid scintillation counter, dark room, electrophoresis and electroblotting equipment for protein and

nucleic acid purification, Bio-Rad Econo System, chromatography cabinet for doing work at four degrees Centigrade.

Veterinary Science Laboratory (Dr. Sagar Goyal, Director):

The Minnesota Veterinary Diagnostic Laboratory Detection (VDL) is a national leader in providing rapid diagnosis of animal diseases, developing new diagnostic methods, and training diagnosticians and veterinarians. The mission of the VDL is to protect and promote animal and human health through early detection and monitoring of diseases. Dr. Sagar Goyal is the supervisor of Diagnostic Virology and Serology laboratories. These laboratories are well equipped to carry out work with animal viruses, bacteria, and bacteriophages including virus isolation in cell cultures and embryonated eggs, negative contrast electron microscopy, and serological tests such as ELISA, hemagglutination inhibition, immunofluorescence, agar gel diffusion, etc. Facilities include centralized glassware washing and autoclaving, walk-in refrigerators and freezers, walk-in incubator, -70^{0}C freezers, liquid nitrogen tanks, incubators, bio-safety cabinets, centrifuges, separate room for immunofluorescence, environmental monitoring equipment, separate media preparation room, and a complete state-of-the-art molecular virology suite. The molecular diagnostic laboratory performs over 2500 tests per week for various avian and mammalian diseases. The well equipped laboratory has 18 thermal cyclers, 2 DNA sequencing readers, 1 video capture imaging system, and is skilled at RNA extraction, DNA extraction, nucleotide sequencing, RT-PCR, PCR, real-time PCR, quantitative PCR, and multiplex RT-PCR. Dr. Goyal has full access to all of the above facilities and equipmen

Research Databases for Collaborative Research

The following research databases have been identified for collaborative research efforts that address NORA priorities. These are available for use as a basis for conducting substudies and facilitating future grant proposals:

- **Colon Cancer Control Study (PI – Timothy R. Church, PhD)**

  Colon cancer screening trial with baseline data from over 45,000 subjects on behavioral, familial, occupational, and dietary risks factors; 30 years of follow-up on mortality; and 20 years of follow-up for colorectal cancer incidence

- **Molecular Epidemiology of Prostate Carcinogenesis (PI – Timothy R. Church, PhD)**

  Population based case control study of prostate cancer in Minnesota and Wisconsin that recruited 2329 cases and 3567 controls. The study collected extensive environmental, behavioral and occupational data, as well as biological samples to examine molecular determinants of prostate carcinogenesis and gene-environment interactions.

- **Regional Rural Injury Study-II, Phase 1: Etiology and Consequence of Injuries Among Farm Children (PI – Susan Goodwin Gerberich, PhD)**

  This project *addressed both etiology and consequences* of agricultural injury in the five-state region of Minnesota (MN), Wisconsin (WI), North Dakota (ND), South Dakota (SD), and Nebraska (NE). Lists of agricultural operations for each state, maintained by the United States Department of Agriculture, were sampled randomly to select agricultural operations for participation in the project. The research design employed an eligible cohort of 4,000 farm households and 16,000 persons, including 8,000 children ≤19 years of age representative of the region. It provided a unique methodology for collecting data, *simultaneously*, for both risk factors and incidence and consequences of agricultural injuries. Data were collected on the characteristics of the operation and persons within the operation household and pertinent injury experience for 1999. All cases (identified through the initial portion of the interview) and controls (identified through an algorithm encoded into the CATI system), ≤ 19 years of age, were interviewed to obtain data on the designated exposures and confounding and modifying variables.

- **Regional Rural Injury Study-II, Phase 2: Agricultural Injury Surveillance (PI – Susan Goodwin Gerberich, PhD)**

  The 1999 Regional Rural Injury Study-II, designed to determine the etiology and consequences of agricultural injury in the five state region of Minnesota, Wisconsin, North Dakota, South Dakota, and Nebraska, served as a basis for this 2001 surveillance effort. Data, comparable to those in 1999 were collected in the same manner for 2001. The research design, again, employed an eligible cohort of 4,000 farm/ranch households and 16,000 persons, including 8,000 children ≤19 years of age representative of the region.

- **Regional Rural Injury Study-III, Consequences of Agricultural Injuries (PI – Susan Goodwin Gerberich, PhD)**

Data were collected for 1,459 eligible agricultural operation households in Minnesota, Wisconsin, North Dakota, South Dakota, and Nebraska. Two six-month injury data collection periods followed baseline collection; annual follow-up evaluation data were collected for two years. By comparing youth in case and control households, changes in health- and work-related characteristics between baseline and follow-up were examined.

• Risk Factors For Violence Against Nurses (PI – Susan Goodwin Gerberich, PhD)

A total of 6,300 Minnesota nurses (registered and licensed practical) was randomly selected from the 1998 licensing databases and surveyed to determine employment and occupational violence experience. In a nested case-control study, relations between environmental exposures and physical assault were examined. Cases of assault in the previous 12 months, and controls randomly selected from assault-free months, were surveyed about prior-month exposures.

• Violence Against Educators (PI – Susan Goodwin Gerberich, PhD)

A total of 26,000 educators teachers, specialists, and administrators was randomly selected from the 2004 Minnesota Department of Education's License List and surveyed to: determine those who worked as educators in Minnesota and did or did not experience work-related violence; collect comprehensive data on violent experiences during the previous 12-month period. A nested case-control study, involving a one-month recall period, enabled identification of risk factors for assaults against educators.

• U.S. Radiologic Technologists (USRT) Cohort Study (PI – Bruce H. Alexander, PhD)

This is a large cohort study of registered radiologic technologists (N=146,000), of which seventy percent are women. The study is an ongoing collaboration between the University of Minnesota, the National Cancer Institute, and the American Registry of Radiologic Technologists (ARRT). The primary objective of the study is to evaluate the health status of radiologic technologists primarily with regard to cancer and occupational exposure to low-dose ionizing radiation, however information on several non-cancer outcomes has been collected, including cataracts, birth defects in offspring of technologists, heart disease, diabetes, neurodegenerative diseases, and benign conditions of the thyroid. Because the main focus of the study has been cancer, there have been few resources to analyze data pertaining to non-cancer outcomes. In addition to health outcomes, a sample of the cohort is being recruited to donate blood samples for studies related to the genetic and genomic determinants of cancer and other conditions.

The original enumeration of the cohort identified 143,517 radiologic technologists from the ARRT files using the following criteria: certified for two years or longer as of 12/31/82 and residing in the United States at the time the cohort was created. In 1992, an additional 2,505 technologists, who met the eligibility criteria but were inadvertently omitted when the data were obtained for the original cohort, were added to the study cohort. The total number of technologists in the study cohort is 146,022. Approximately 90,000 participants completed self-administered questionnaires in the mid 1980s and again in the mid-1990s. Of these approximately 70,000 completed both questionnaires. In 2004 a third questionnaire was mailed to surviving members of the cohort who had previously participated. A specific focus of this questionnaire is to develop improved estimates of ionizing radiation exposures over time.

To date the study has reported increased risks of breast cancer, skin cancer, and leukemia in technologists who worked prior to 1950. The continued follow-up will help determine whether these risks carried through employment in later years.

• Taconite Worker Health Study (PI Jeffery Mandel, MD, MPH)

The Taconite Workers Health Study (http://taconiteworkers.umn.edu/) was formed in response to an apparent excess of mesothelioma among taconite workers discovered by the Minnesota Department of Health. In response to concerns of citizens and legislators representing the Iron Range, University of Minnesota researchers conducted several studies. These studies evaluated whether working in the taconite industry and exposures to dust from taconite operations were related to mesothelioma, lung cancer, and other respiratory diseases. The original cohort for this study included over 68,000 workers. The cohort was linked to mortality and cancer incidence records to evaluate disease rates, and nested case control studies were conducted for mesothelioma and lung cancer. Work histories and industrial hygiene data were collected to estimate current and past exposures. A screening study of nearly 1,200 current and former workers evaluated prevalence of non-malignant respiratory disease. Ongoing research is characterizing the particulate exposure, including exposures to elongate mineral particles.

Computer Resources

The University of Minnesota Office of Information Technology is a campus-wide system of computing resources dedicated to teaching and research. Trained consultants provide staff and faculty with assistance in using selected statistical software, such as SAS and SPSS, as well as help in purchasing selected software at reduced prices. Network and Telecommunications Services (NTS) provides a wide range of telephone and network related services for University departments, faculty, staff and students.

The Division of Environmental Health Sciences also has microcomputer capabilities for conducting complex statistical analyses and data management functions. All research data and relevant statistical analysis programs are stored on central servers within the division. These servers are backed up daily and comply with applicable University secure configuration requirements. The division also employs a full-time Information Technology Specialist, who contributes expertise relevant to many information technology issues.

Computer security is comprehensive and starts at the University's firewall system that blocks incoming and outgoing traffic corresponding to network services that are known to be problematic, for example, ports used by Microsoft networking services aren't allow to traverse the firewall in either direction except via an authenticated VPN connection. E-mail coming in to the University mail servers is scanned for viruses before being delivered to user accounts. Networking Services personnel monitor the network for *issues* that may prove troublesome. The Division of Environmental Health Sciences operates a Microsoft Domain service which manages authentication and access control for machines within the Division.

Other Resources

Library Facilities

The University of Minnesota's Library System is one of the University's and the State's greatest intellectual and capital assets. Housed in thirteen locations, the University Libraries have more than seven million print volumes and 109,000 serial subscriptions, making it the 17th largest research library in North America.

The University of Minnesota Biomedical Library, located on the Minneapolis campus, has a collection of over 500,000 volumes and 5,000 journal titles in print and electronic format. These materials, in addition to numerous other media resources available through the library, relate specifically to the Health Sciences. The Biomedical Library further extends its resource by participating in inter-library loans throughout the United States and abroad. The Biomedical Library has a Bibliographics Search Service that provides computer-produced bibliographics. In addition to MEDLINE, the search service has access to approximately 200 databases, using BRS, DIALOG, and NLM.

Additional libraries in the University of Minnesota Twin Cities' system include Walter and Wilson Libraries (social sciences, education and special collections). In addition to strong comprehensive research collections, each of these libraries offers a full range of reference and information services relevant to specific areas.

Other Program Resources

In addition to the resources identified, each of the programs identified within the MCOHS Education and Research Center has numerous resources with which to accomplish their academic and research training goals. These are further identified in each of the respective program proposals.