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Translating Science to Improve Urban Health: An International Linkage of Geospatial Information with Environmentally Induced Asthma Models

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Translating Science to Improve Urban Health

An international linkage of geospatial information with environmentally induced asthma models

by Julie O'Connor

Wayne State University has a long-standing commitment to bringing change to urban health, particularly through research on disparate outcomes in disease, prevention and cure experienced among different ethnic, cultural and socio-economic groups.

Through WSU's *Research Enhancement Program to Support Clinical Translational Science in Urban Health*, the university is joining together researchers from multiple institutions. These teams bring together expertise from their respective disciplines to analyze problems from many perspectives, with the goal of resolving them across a variety of domains such as biological, psychological and environmental.

By fostering multidisciplinary clinical and translational research at WSU, its affiliates and collaborating institutions, WSU hopes to be a true academic home for research that will impact healthcare throughout the United States and beyond. One such project funded through this initiative has great potential in aiding the control and management of community, family and school-based interventions of asthma and potentially other diseases in children and adults in the cities of Detroit and Windsor.

The study, *Linking Geospatial Information with Public Health Outcomes: Modeling Asthma Morbidity Across an Urban International Border*, is potentially one of the first international studies that is comparing and contrasting environmental indicators with specific health outcomes in cities with shared pollution sources, yet very different healthcare systems.

In collaboration with the University of Windsor, University of Toronto, Henry Ford Health System, Air Health Science Division of Health Canada and the Canadian Institute for Health Information, Linda Weglicki, Ph.D., R.N., assistant professor of adult health in WSU's College of Nursing is leading this study that is building upon the University of Windsor's research that developed land use regression and air dispersion models to map key environmental indicators and their relationship to health conditions in Detroit and Windsor.

"Through the North American Public Health Institute, a joint effort between Wayne State University and the University of Windsor, a mapping and health promotion group formed about two years ago," said Dr. Weglicki. "While the group met fairly often during those first two years, the focus for this research didn't come together until the RFP for the Research Enhancement Program was announced. While developing the proposal, we not only added additional researchers who had expertise in specific areas, we also felt that it was important to identify an advisory board that reviewed and advised us on key sections of our proposal which is a study to develop spatial-temporal models using GIS to identify and predict environmentally induced health conditions in adults and children in and across our international border." The research team, known as the Geospatial Determinants of

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from left: Dr. Phil Granerio, University of Windsor; Alice Grgicak-Mannion, Great Lakes Institute of Environmental Research; Dr. D. Martin Raymond III, Eastern Michigan University; Dr. Linda Weglicki; WSU College of Nursing; Dr. Larry Lemke, WSU Department of Geology; Shanti Menon, Project Director (WSU); Dr. Lois Lamerato, Henry Ford Health System, and Jason Booza, Demographer, Department of Family Medicine and Public Health Sciences, WSU.

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Health Outcomes Consortium, or GeoDHOC, is subdivided into three expert teams to accomplish the project aims.

Team I, led by Dr. Iris Xiaohong Xu, associate professor of civil and environmental engineering at the University of Windsor, is primarily focused on gathering spatially distributed air quality data from Detroit and Windsor and testing the applicability of static land use regression and air dispersion models. Team I is also responsible for deployment of air samplers for both sampling periods in Detroit and Windsor. Larry Lemke, Ph.D., assistant professor of geology at WSU and Phil Graniero, Ph.D., associate professor of earth and environmental sciences at the University of Windsor are key members of Team I.

Team II, led by Dr. Weglicki, is focused on health outcomes and health outcome data. As such, they are responsible for identifying and collecting comparable and compatible measures of asthma morbidity from Detroit and Windsor health systems. This team comprises Lois Lamereto, Ph.D., health services epidemiologist and Richard Krajenta, programmer/analyst at Henry Ford Health System; Helen Krouse, Ph.D., R.N., professor of adult health in the College of Nursing at WSU; Delbert Raymond, Ph.D., R.N., assistant professor of nursing at Eastern Michigan University; Paul Villeneuve, Ph.D., professor of public health sciences at the University of Toronto and research scientist at Health Canada; and John Reiners, Ph.D., professor in WSU's Institute of Environmental Health Sciences.

Team III, led by Jason Booza, research assistant and demographer in WSU's Department of Family Medicine in the School of Medicine, is focused on geospatial information systems (GIS) and data integration. This includes geospatial modeling for deciding the best locations for sampling sites based on land use, traffic patterns, meteorological conditions, and population differentials. They will also integrate the air quality data, spatial attributes, and health outcomes into a final GIS framework. Alice Grgicak-Mannion, GIS manager for the Great Lakes Institute for Environmental Research (GLIER) at the University of Windsor and Richard Krajenta, Henry Ford Health System, are key members of the GIS and data integration team. Teams of 20 undergraduate students and two graduate students from Wayne State University and the University of Windsor's departments of geology, environmental science, and civil and environmental engineering were recruited to support this project. They received extensive training on the science and technology of the various air samplers, and were integral in the handling, set up and removal of air samplers for the first round of air sampling. "The air samplers will be deployed on two separate occasions at 100 locations throughout Windsor and Detroit," commented Dr. Lemke. "Sampler locations are chosen to cover a consistent geographic distribution throughout both cities, and prioritized locally based on land use, population density, and security for air sampling equipment."

"This project was an exciting introduction to research for a large group of undergraduate students," said Dr. Lemke. "Hands-on experience is often a much more effective way of learning, and this project gave our students an opportunity to learn more than a traditional textbook or classroom experience could provide. It has also motivated many of them to think seriously about the possibility of furthering their studies in graduate school," he added.

In addition to GeoDHOC team members and student researchers, myriad other university staff and administrators, outside consultants, city employees, customs brokers and numerous others were needed to help navigate through many unexpected challenges that were faced with this international project. "We were confronted with unforeseen situations such as obtaining special university permission to pull city permits to deploy air samplers; transferring equipment and air samplers across the border without being opened and contaminated by customs agents; deploying air samplers in secure places such as city fire stations; and dealing with numerous other financial situations brought on by this international project," said Dr. Weglicki. Many employees throughout Wayne State University and the University of Windsor faced unusual challenges in their jobs to help get this project under way and within the

proposed timeline. “We are within our projected timeline but would not be here without the help and expertise of so many throughout our colleges and administrative departments – it truly has been a learning experience for all and we are appreciative of the time and assistance of so many people,” she added.

Translating research; finding disease interventions

This project will aid in the development of communities and school-based interventions to control and manage asthma in children and adults throughout Detroit and Windsor. It will establish the foundation for translational research that can be applied to other diseases and health outcomes by merging disparate data frameworks that are not normally integrated, offering a new pathway for expanding research into other health outcomes.

“The broader, long-term goal for the group is to be able to apply similar geospatial models to investigate other diseases such as cardiovascular diseases, cancer, diabetes and more, and to inform targeted policies to improve the health of urban residents,” said Dr. Weglicki. “Once we have data from the second deployment of air samplers in May 2009, we will be able to begin making comparisons for our current study. Incorporating other health conditions in to the research project is a major goal of this team.”