

**Asthma-related Events in Relationship to Heat and PM2.5,
Montgomery County, Ohio
2005-2009**

**ENVIRONMENTAL PUBLIC HEALTH TRACKING
ASTHO FELLOWSHIP REPORT**

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Submitted to
Association of State and Territorial Health Officials
Environmental Public Health Tracking: State-to-State Peer Fellowship Program
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INTRODUCTION

According to the National Environmental Public Health Tracking Network (EPHTN) website, the Centers for Disease Control and Prevention (CDC) currently funds 23 states and local health departments to develop and maintain local tracking networks. The state of Ohio has not been awarded EPHTN funding.

In February 2011, State-to-State Peer Fellowship funds from the Association for State and Territorial Health Officials (ASTHO) were awarded for an epidemiologist in the Ohio Department of Health (ODH) Bureau of Environmental Health (BEH) to cover travel expenses for a 3-day mentoring site visit and a 3-day training workshop, in addition to conducting an Environmental Public Health Tracking (EPHT) pilot project. As part of the fellowship proposal, an additional fellow's activities were funded in part by a CDC State Asthma Grant.

The purpose of the ASTHO Tracking Fellows Program is to:

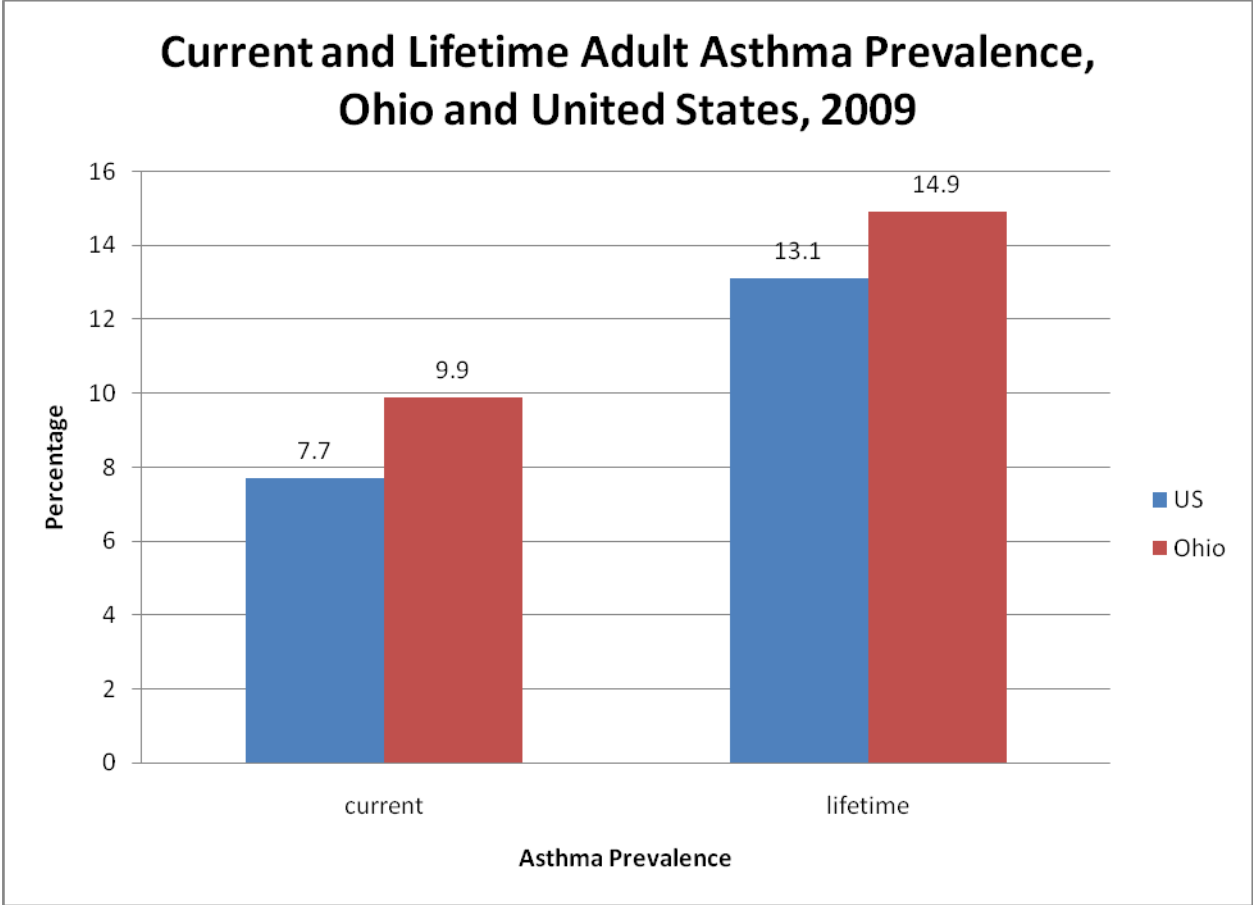
- Assist non-funded state and territorial health agencies in gaining first-hand experience from their peers in states that are funded for tracking activities.
- Strengthen peer networks across state and territorial health agencies, and
- Explore ways to integrate environmental epidemiology/data collection activities of non-tracking funded states into the National Tracking Network.

Climate change is likely to increase the frequency of air mass stagnation events across the United States (Leung and Gufstafson, 2005). Accordingly, the National Climatic Data Center has proposed Climate Impact Indicators, including an air mass stagnation index (ASI), in an attempt to gain a better understanding of the impact of weather on socioeconomic sectors of the United States. To best plan targeted health service planning, risk communication, and conduct program evaluations, the tracking of such environmental health indicators of climate change must incorporate health outcomes, environmental and population vulnerability indicators, as well as indicators of mitigation and adaptation.

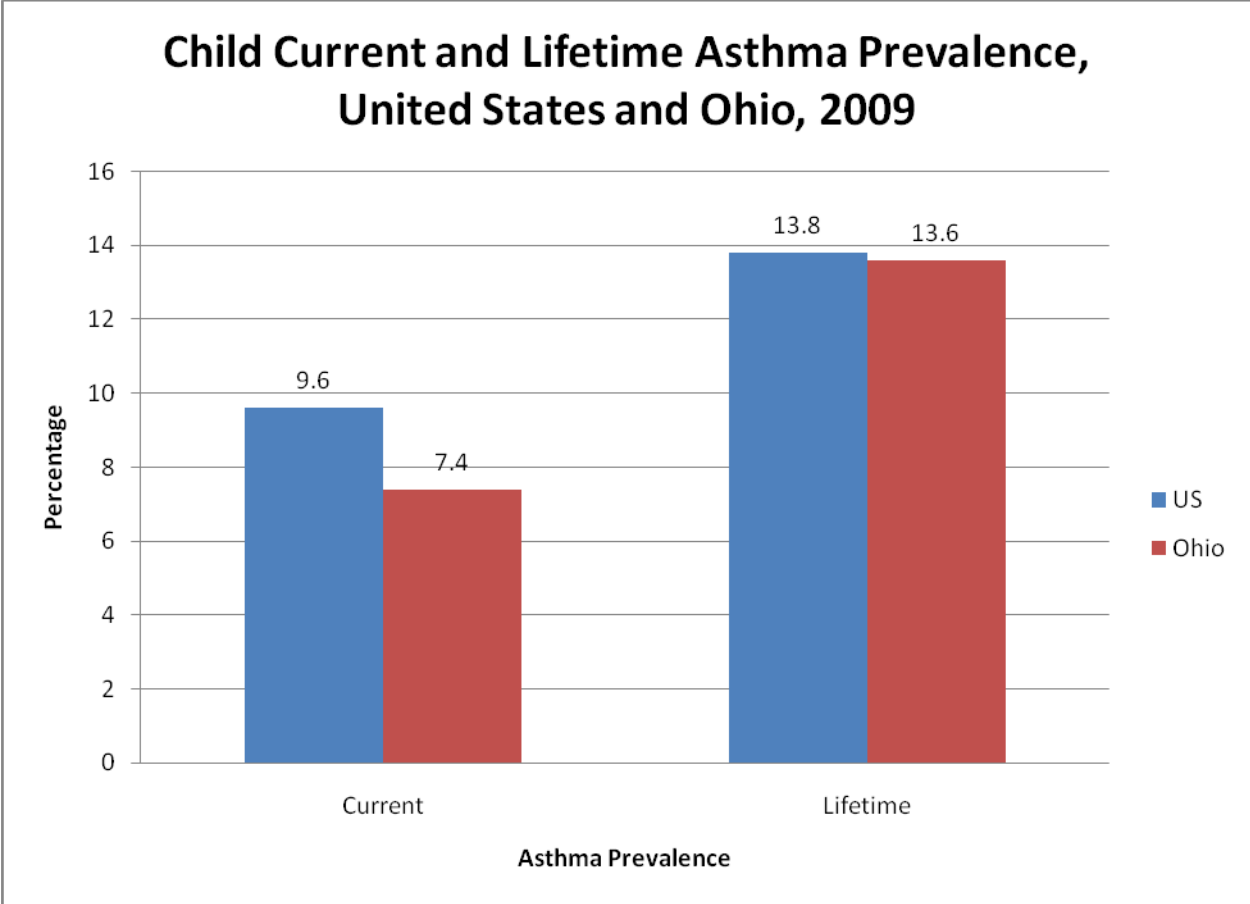
The specific indicators of climate change (environmental hazard data) this fellowship pilot project focused on were extreme heat events, air mass stagnation events, max/min temperatures and heat index, and pollen counts. The specific indicators of health the project targeted were asthma and chronic lower respiratory disease (emergency department visits and hospitalization discharge data) and T67 series for ICD 10.

Asthma was selected as a health indicator (health effect data) because it is a disease that affects an increasing number of Ohioans. Currently, 14.9 percent of adults and 13.6 percent of children have been diagnosed with asthma in Ohio. These rates are

significantly higher than in 2003. Populations vulnerable to the effects of climate change, such as children, low-income families, and older females are more likely to be diagnosed with asthma (Behavioral Risk Factor Surveillance System, 2009).



Source: Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Year 2009.



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The potential for future climate changes to have an impact on asthma and other allergic diseases has been recognized for some time, due to the link between climate and many allergens and allergen-producing organisms, as well as ambient air pollution. It is feasible that faster plant growth, earlier plant maturity, and longer growing season, in addition to earlier pollen season and increased season duration and increases in pollen quantity and allergenicity have already had an impact on asthma.

Chronic Lower Respiratory Disease (CLRD) is the second health indicator (health effect data) the team selected to evaluate. CLRD is a group of diseases that cause airflow blockage and breathing-related problems. The use of CLRD as an additional indicator of health allows for a more accurate reflection of the effect climate change may have on airway disease beyond limiting our evaluation exclusively to asthma hospital coding.

REPORT ON TRACKING ACTIVITIES

I. National Environmental Public Health tracking workshop, April 25-28

The 2011 Environmental Public Health Tracking Workshop was held at the Marriott Brooklyn Bridge in New York City, New York, from April 25 through April 28. The purpose of this event is to provide an opportunity for grantees and partners to discuss expectations and direction for the national EPHTN, provide opportunity for workgroups to meet, and engage participants in plenary sessions on issues relevant to the program. All twenty-three states and one city funded by CDC, in addition to other partners and collaborators, were in attendance and participated in this event.

Learning experience:

The tracking fellows from Ohio participated in both the pre-workshop training and the three days of scheduled workshop meetings and sessions. Through this experience, the fellows gained a better understanding of the CDC requirements for tracking networks, the portals (both the public and the secure), and the various approaches the grantees are using to build their networks, visualize and present the data (particularly with regard to geospatial representation and smoothing techniques), and make data-driven public health decisions. This was also an excellent opportunity to build professional relationships with staff from funded tracking states, CDC, and other ASTHO tracking fellows.

Portal demonstrations by multiple states showed different but effective approaches to sharing data with the public, and providing educational information about health conditions. Of particular interest, as the ODH is just beginning to explore EPHT, was the plenary session featuring open source software options for geospatial analysis and visualization. Clearly, many state agencies across the country continue to face budget shortfalls, making it difficult to persuade administrators to spend large dollar amounts on new technologies, and it was rather encouraging to hear about and see some of these resources in action.

Due to the fact that the ODH was represented at this workshop by two fellows, the team was able to attend twice as many of the concurrent sessions and therefore gain a broader understanding of the different concerns and issues the funded states have with regard to various required health indicators. One of the frequently discussed issues in the content work group sessions was a lack of national standards for data suppression rules with regard to small numbers. The discussions focused not only on an inconsistency between jurisdictions, but also an inconsistency from program to program (i.e. cancer versus birth defects). These work group sessions were particularly helpful in providing a better perspective on the frustrations that the funded states face with the CDC portal

requirements, in addition to their commitments to having high quality usable data, meaningful data, and developing data-driven interventions and outreach programs.

Two sessions were especially relevant to the project that ODH is undertaking. One session concentrated on how to define a heat wave or heat event, and the problems that are inherent with the current definition, such as consistency across health departments, planning and weather agencies. Another session brought out an issue which had not been considered previously by the ODH Asthma program: the issue of counting hospital transfers. When a person is admitted to a hospital from another medical facility, the transfer is often not noted, and is treated as a new admission. The result is that one patient is counted as two admissions of myocardial infarction. The discussion centered on myocardial infarction, which can involve transfer up to 30% of the time, as opposed to asthma, which involves transfer only 2% of the time in Ohio. However, the asthma epidemiologist will be contacting the Ohio Hospital Association to inquire about the effect this issue may have upon the counting of hospital discharges in Ohio.

The presentations by and panel discussions involving the academic partners of excellence were enlightening, and encouraging. As public health agencies, we frequently find ourselves attempting to balance funding with agency policies limiting or prohibiting “research” activities. Communities with health concerns are informed that research activities must be pursued by institutions of higher learning, nonprofit organizations, and/or the medical community. The academic partner of excellence from the University of Illinois-Chicago, Dr. Leslie Stayner, was not an unfamiliar face to the EPHTN fellows from Ohio. In January of this year, he and his research team met with bureau epidemiologists and data stewards at the ODH to present their potential study design and determine what data might be available from the agency in order to aid in their research attempts to link health outcome data with agricultural water contamination in the Midwest.

II. Visit host state February 28-March 2, 2011

The ASTHO tracking fellows program matched the Ohio fellows with the state of Massachusetts Department of Public Health as their mentor state. Involved with the EPHTN since 2002, this state has been a pioneer in the development of state environmental public health tracking networks. The purpose of the three-day host state visit was to provide clarification for portal development and standards, provide insight on metadata creation and submission, and present an opportunity to convey lessons learned. After conference calls and multiple emails, additional topics were added to the agenda for both the fellows and the mentoring program to discuss.

Accomplishments:

The Ohio fellows visited the Massachusetts Department of Public Health (MDPH) tracking staff from February 28 through March 2, 2011. The visit was well planned with several conference calls and emails beforehand between the Ohio fellows and MDPH staff, facilitated by the ASTHO fellowship program officer, in order to finalize an agenda of topics to cover. Suzanne Condon, Associate Commissioner, MDPH, and Martha Steele, Deputy Director, Bureau of Environmental Health, MDPH, participated in the entire first day of presentations, along with several of their senior program staff. All three days of the site visit were quite interactive, with plenty of time for questions and answers throughout presentations, and meal opportunities and breaks for reinforce mentoring relationships and professional interaction between mentor staff and fellows.

Day one focused on the historical overview of the MDPH tracking program and environmental public health in the commonwealth. This first day of meet-and-greet with the MDPH staff also allowed for an overview presentation of the proposed Ohio pilot project, with a focus on asthma and indicators of climate change in Ohio. Day one wrapped up with several information technology (IT) presentations pertaining to the portal development, the Massachusetts EPHT portal design process and Geographic Information Systems (GIS) application, a dialogue on securing data sharing agreements, and a group discussion regarding IT lessons learned.

Day two covered a wide variety of related topics, including mapping applications, key features, public versus secure portals, indicator development, data analysis, and data representation (including portal content, metadata, and development of portal FAQ's). Following lunch, the group resumed with a discussion of manipulating and analyzing environmental (heat/climatic data and air mass stagnation events) and health (Emergency Department data, hospitalization data, and excess morbidity and mortality data). The day concluded with a discussion of climate change activities at MDPH.

The third and final day of the mentoring site visit focused on wrap-up and a time for questions and answers, in addition to presentations on program marketing outreach, Harmful Algal Bloom surveillance, and actions and policies driven by EPHT data.

Learning experience:

As noted previously, this interactive mentoring experience provided presentations on a wide array of topics regarding the development of a state EPHTN, in addition to ample opportunity for informal question and answer sessions. The MDPH has been a funded tracking state since 2002, and has several years of experience, in addition to their 25 contributing staff with a wide array of skills and backgrounds (including epidemiology, geographic information systems, data systems management, meteorology, environmental toxicology, health education/outreach, and community assessment) which complement the tracking program activities.

The MDPH EPHT program has enjoyed a uniquely stable staff composition, and the majority of the staff participating in our mentoring visit had been with the program since its inception. Collaborative relationships with other bureaus within MDPH, such as the cancer registry, the bureau of health statistics and research, the center for birth defects, and the office of the general council, all help to enhance the effectiveness of this program. Good working relationships with other state agencies, including the Department of Environmental Protection, the Division of Health Care Finance and Policy, in addition to the Massachusetts School Nurses Organization and the U.S. Environmental Protection Agency (USEPA), all serve to enhance the data collection and interpretation for their state EPHTN.

The demonstration of the MDPH EPHTN portal was both an inspirational and intimidating goal to aim for in the long-range. The community-level cancer data (with standardized incidence ratios), and the video portal tutorial would both be especially valuable components to include in such a portal for the state of Ohio, as well as a frequently asked questions section and a statement of data limitations/uses. It is clear that the team carefully considered the following four elements when they were designing the portal: ease of use, consistent look and feel, simple navigation, and that it needed to work across platforms, operating systems, and browsers. In addition to these four elements, the team emphasized the importance of developing a portal vision document for the Information Technology (IT) department, with clearly stated goals, objectives, business rules, and triggers for the portal design.

It was also helpful to hear from the program team about some of the barriers they have encountered in the development of their portal, and in their access to data. Perhaps the most frequently mentioned barrier, the Family Educational Rights and Privacy Act (FERPA), was intended to protect students' education records, but has caused some confusion and anxiety among school staff and administrators regarding health surveillance data (in this case, asthma data). However, much of this barrier has been overcome with good working relationships with the school nurses and the use of de-identified asthma data. Similarly, misunderstandings about the Health Insurance Portability and Accountability Act (HIPAA) can serve as a potential barrier to obtaining surveillance health data. Other state agencies, or even may have data stewards who are reluctant to share data, but carefully-written data use agreements can help to ease much of these tensions and fears.

This mentoring visit established professional relationships which will be utilized and built upon as Ohio embarks on the analysis phase of its pilot project as well as future steps to establish an early EPHTN.

Application of what was learned:

One particular difference between Massachusetts and Ohio, with regard to data, is that MDPH is the data steward for all hospital data. However, in Ohio, the Ohio Hospital Association (OHA), a non-governmental organization, is the data steward. Currently, Ohio has data use agreements in place to have aggregated de-identified blocks of data transferred from the OHA, but for the specific purpose of conducting asthma surveillance.

The Asthma Program at ODH already has Memoranda of Understanding with other agencies and organizations, such as Ohio Hospital Association and the Ohio Department of Job and Family Services (Medicaid data). Currently, the ODH Asthma Program is creating a new Memorandum of Understanding so that the Ohio Asthma Health Plan Collaborative can share claims data with several health care plans from around the state, with the assistance of the Legal Affairs office.

Further, the MDPH portal with its Standardized Incidence Ratio (SIR) calculator with census tract level data and color mapping (as well as frequently asked questions) was of particular interest to one of the fellows. As a representative for the BEH on the ODH Community Cancer Assessment Workgroup, this portal was shared and discussed with other workgroup members as a potential model for communicating community cancer data to the public in an effort to decrease the burden on the cancer epidemiology program at ODH.

III. Small Project

Abstract

The purpose of this study is to evaluate season trends and potential environmental triggers for exacerbation of underlying asthma and chronic lower respiratory disease (CLRD), by integrating and analyzing existing data collected by other state and federal agencies and partners. Due to time and technology constraints, and at the suggestion of our project officer and the application reviewers, our team decided to pilot our investigation by limiting it to data collected for the geographic parameter of Montgomery County, Ohio. The anticipated completion timeline, as stated in our fellowship proposal, is the end of August, 2011.

Specific aims

The specific indicators of climate change (environmental hazard data) this fellowship project focused on were extreme heat events, max/min temperatures and heat index, and PM2.5. The specific indicators of health the project targeted were asthma and chronic lower respiratory disease (emergency department visits and hospitalization discharge data). If possible, the fellows will attempt to analyze by age and sex in order to

evaluate potential risk populations. Race and socioeconomic status, while known risk factors for asthma, are not available for these data sets.

Benefits and significance to the state of Ohio and EPHTN

The short-term benefit of this project is that it will aid in identifying areas and/or demographic groups most sensitive to adverse health events related to air quality and temperature, and should aid in evaluating threshold indicators for health messaging and prevention strategies to reach vulnerable populations.

The long-term benefit of this project, and the fellowship program as a whole, is that it has increased the agency awareness of EPHT programs in other states, and has provided an opportunity for professional networking and mentoring in the area of environmental public health tracking. Additionally, the pilot project has served to introduce EPHT benefits to stakeholders and build a core of collaborators on which a statewide EPHT can be built.

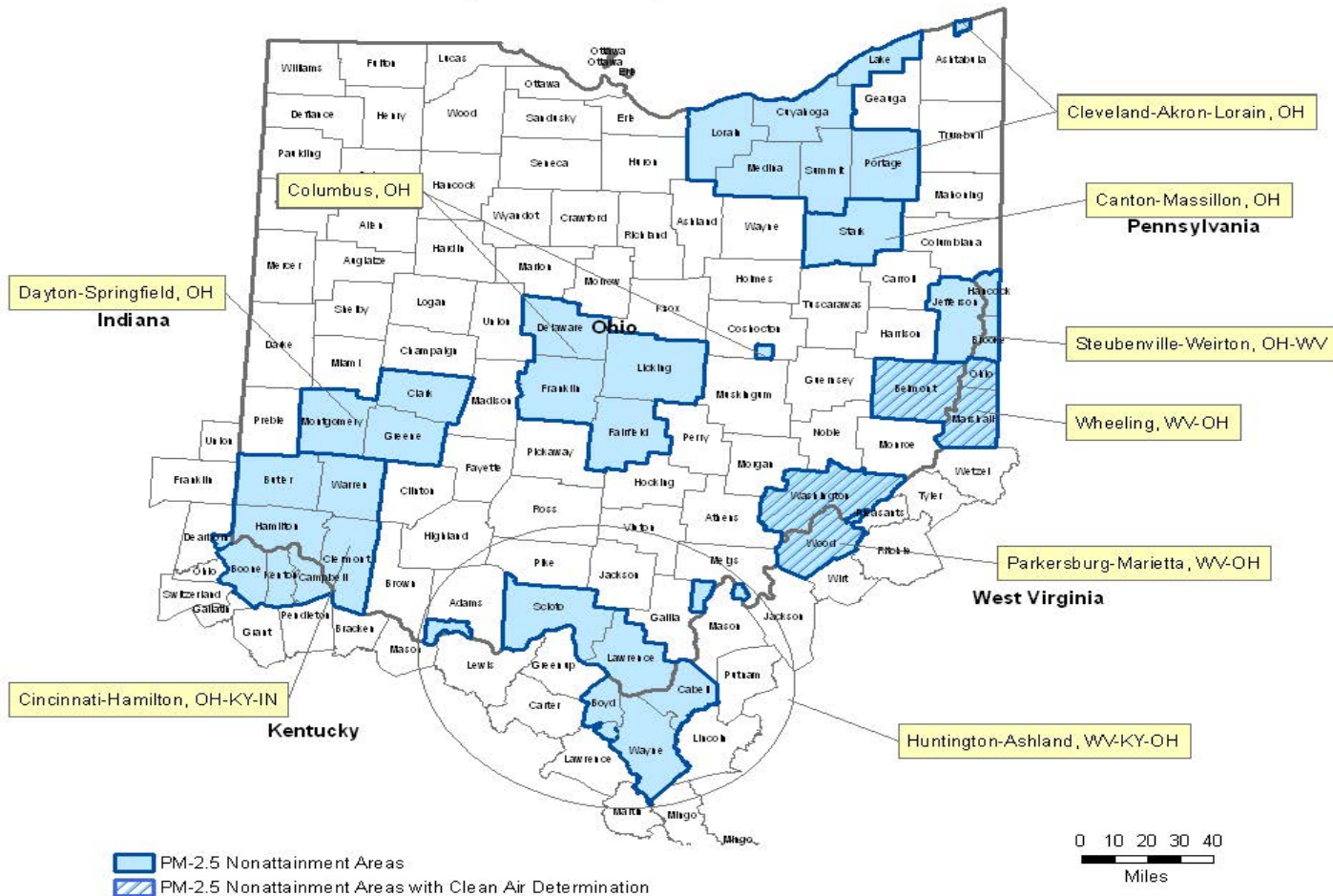
Research design, methods, key personnel

At the suggestion of the ASTHO fellowship project officer and the fellowship application reviewers, the Ohio fellows opted to reduce the scope and magnitude of the project by limiting the geographic area to Montgomery county rather than the entire state of Ohio. The rationale for selecting this geographic area was that the Regional Air Pollution Control Agency (RAPCA) is located in Dayton, and serves Montgomery and its surrounding counties (Clark, Darke, Greene, Miami, and Preble), is a good resource for continuous PM 2.5 and ozone data, and has historically had a good collaborative relationship with the ODH Bureau of Environmental Health (BEH). Montgomery county is also geographically situated on the fringe of the lower portion of the Ohio River Valley, an area historically known for poor air quality as a result of stagnant air conditions and a high volume of air pollution-emitting industries.

The current air quality designation for the Dayton-Springfield area, including Clark, Green, and Montgomery counties is out of attainment with respect to the 1997 annual PM_{2.5} national ambient air quality standard (NAAQS). However, air quality monitoring data collected between 2008 and 2010 in the region demonstrate attainment of the NAAQS and there is evidence that the improved air quality is due to permanent, enforceable emission reductions.

Ohio PM-2.5 Nonattainment Areas (1997 Standard)

12/2010



Source: <http://www.epa.gov/airquality/greenbook/oh25.html>

Other collaborators include the ODH Situational Monitoring and Event Detection (SMED) unit, the Ohio Asthma Coalition, the Regional Air Pollution Control Authority (RAPCA), the Ohio Hospital Association (OHA), the National Weather Service, and the Ohio EPA Division of Air Pollution Control.

Hospital discharge data, emergency department discharge data, emergency department chief complaint data, PM_{2.5} data, and temperature and heat index data, were obtained for the following years 2005-2009 for Montgomery County, Ohio residents. The data will be cleaned and analyzed by the fellows, with technical guidance from MDPH mentors and ODH senior epidemiology staff, using the statistical software package SAS.

The team hypothesizes that there will be a positive correlation between extreme heat events, such as heat waves, and health data reflecting increased asthma-related encounters (emergency department visits and inpatient hospitalizations). We further

hypothesize that increases in PM_{2.5} will drive increases in these same medical encounters.

Results/Expected Outcome

The proposed timeline for this project is to run through the summer months of 2011. However, by limiting our geographic study area to Montgomery County, Ohio, rather than the entire state, the team has been able to collect much of the data and is currently on-schedule with their proposed timeline. It is anticipated that the results will be prepared and in poster format for upcoming professional meetings (i.e. the Ohio Asthma Research and Education Conference 2012 and the Ohio Epidemiology Symposium) in late 2011 and early 2012. Furthermore, upon completion, a final report of the pilot project findings will be printed and shared with stakeholders and partners, including ASTHO and MDPH.

The ODH Bureau of Environmental Health believes that this project will be of benefit to the entire Department of Health as well as the citizens of Ohio. This project will help to forge new relationships between ODH and other Ohio agencies, organizations and researchers, within Ohio, as well as other states. It is the Bureau's intent to have an additional project demonstrating the relationship between climate change and respiratory illness, so that Ohio communities can plan in order to prevent future heat-related and environmentally-related respiratory illness.

Discussion

While this project is still in progress, it is clear that one of the bigger limitations is that race and socioeconomic status (known risk factors for asthma) data are unavailable for asthma-related inpatient hospitalizations and emergency department visits. Additionally, due to the fact that unique patient identifiers are not available for these data sets, it is difficult to determine the true burden of asthma in the selected population (counts are based on "events" rather than individuals), and impossible to determine the amount of recidivism.

Furthermore, as we learned at the National Tracking Workshop, the effect of patient transfer from one facility to another may inflate discharge numbers by up to 3 percent.

IV. Other activities carried out during fellowship

During the fellowship period, the Ohio fellows were invited by the Ohio EPA to participate in a GIS training workshop conducted by staff from National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center in the use of satellite imagery for identification of potential Harmful Algal Blooms (HABs). They attended this daylong training and gained valuable insight regarding how to access the

NOAA imagery, view and interpret the files in Arc-GIS, and identify potential areas for concern.

PLANNED ACTIVITIES

The ODH BEH will continue to explore opportunities to identify and work with EPHT type data, and will continue to build relationships with data stewards and local public health partners. The ODH fellows will continue to network with their Massachusetts mentors and other EPHT states to benefit from additional mentoring opportunities and learn from their predecessors' tracking experiences. This fellowship opportunity has served to build agency capacity and interest to put Ohio in a better position for award of EPHT grant funding should it become available in the future. Following the completion of the fellowship pilot project, it is anticipated that the team will expand its tracking activities incrementally to other regions of the state, and will incorporate geocoded data for spatial analysis and visualization.

CONCLUSION

Although the pilot project is still underway, this fellowship opportunity has provided the ODH BEH representatives with the opportunity to communicate to senior management the importance of EPHT and the advances made in EPHT by other state public health agencies. Our mentor state, Massachusetts, is perhaps one of the EPHT "all-stars" as a result of the multiple years of experience their agency has accumulated as a funded EPHTN state and their diverse composition of multi-skilled staff. Their program staff have gone above and beyond in encouraging the ODH fellows and have repeatedly emphasized their availability to share SAS coding language, share printed information, and answer questions we may encounter in the process of laying the foundation for an Ohio EPHTN.

The short-term outcome of the project, to identify areas and/or demographic groups most sensitive to adverse health events related to air quality and temperature, and evaluate threshold indicators for health messaging and prevention strategies, should be realized at the end of the summer, 2011. The pilot project has brought stakeholders and data stewards together in a collaborative spirit to realize how their agency objectives compliment one another.

The long-term benefit of the project, is that the fellowship opportunity has increased the ODH awareness of EPHT programs in other states, and has forged mentoring relationships which will position the ODH with a more solid foundation in developing a statewide EPHT network.

BUDGET NARRATIVE

Out of State Travel

\$282.70

EPHT Conference, New York, New York (*not yet reimbursed*)

Per Diem	1 trip x 3 days = 3 @ \$70/day	\$210
	Transportation to/from airport (\$32.70+ \$40.00)	\$72.70
<u>Printing</u>		<u>\$650</u>
Printing of final report for distribution (<i>Anticipated</i>)		
	500 copies @ \$1.00 ea	\$500
	Printing of poster for conference presentation (<i>Anticipated</i>)	\$150
<u>TOTAL COST OF PROJECT FOR ASTHO</u>		<u>\$932.70</u>

REFERENCES

Centers for Disease Control and Prevention (CDC). "About the Program – CDC Tracking Network." *National Environmental Public Health Tracking Network*. 27 September 2010. CDC. 18 April 2011. <<http://ephtracking.cdc.gov/showAbout.action>>

Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Year 2009.

English PB, Ross Z, Anderson H, Boothe V, et al. 2009 Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative. *Environ Health Perspect* 117(11): doi:10.1289/ehp.0900708

Leung L.R. and W.I. Gustafson Jr. (2005), Potential regional climate change and implications to U.S. air quality, *Geophys. Res. Lett.*, 32, L16711, doi:10.1029/2005GL022911