Bronzeville Air Quality and Public Health Partnership
A community-scale air quality monitoring project in Chicago, Illinois

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ABSTRACT

This paper presents the research protocol of the Bronzeville Air Quality and Public Health Partnership, a community-based affiliate of environmental researchers, medical professionals, and community leaders that works to address concerns surrounding local sources of air pollution and high asthma prevalence in the Bronzeville/ Grand Boulevard community. The Partnership's research agenda is made unique by a specific focus on developing effective methods for identifying very small-scale and short-term patterns in air quality that pose threats to respiratory health, and on communicating health-related environmental information to the public in a manner that is responsive to these patterns.

INTRODUCTION

The Bronzeville Air Quality and Public Health Partnership is a coalition of community residents and leaders, non-profit agencies, academia, health practitioners, and government, working together to ameliorate negative respiratory health impacts correlated to location-specific air pollution sources. The Partnership originally formed to address the extremely high prevalence of asthma in this low-income, African-American neighborhood on Chicago's South side, and planned to do so through a combination of community health education and community-driven research on air pollution and related health effects.

The Partnership is made up of researchers, activists, and representatives from the Center for Neighborhood Technology, Grand Boulevard Federation, Grand Boulevard Asthma Coalition, Illinois Institute of Technology Inter-Professional Program and Department of Chemistry, Chicago Department of Public Health Epidemiology Program, University of Chicago Asthma Center and Chicago Health Studies Department, Michael Reese Hospital, Provident Hospital Asthma Program, Chicago Housing Authority, and Stateway Gardens public housing community.

Since large-scale demolition of Chicago Housing Authority high-rise residences began in the community in 1997, residents have become increasingly concerned about excess pollution (particulate matter) generated by the demolitions. In response, the Partnership developed a research agenda to test, document, and accomplish the following goals:

1) **Goal (Hypothesis) #1:** To investigate the correlation of demolition activities and diurnal (daily) patterns in local ambient particulate air quality.
2) **Goal (Hypothesis) #2**: To investigate the correlation of diurnal patterns in local ambient particulate air quality and health effects among a susceptible population.
3) **Goal #3:** To develop and implement a model for mobilizing internal (community-base) and external (systems-level) organizations and resources on a sustained basis throughout the

reformation of an urban community; to engage diverse groups in analyzing a problem together, investigating and implementing solutions.

The Partnership originally hoped to address the problem that, although there is currently a great wealth of information concerning air quality in metropolitan areas, most of this data fails in two ways to directly address local environmental health concerns:

(1) **Little monitoring is currently done in locations where people spend significant amounts of time outdoors,** such as in schoolyards, parks, outdoor shopping centers. Concentration levels in these spaces are likely lower than in the traditionally monitored spaces such as in industrial areas, along highways, and at airports. Relatively little is known about pollutant levels in more densely populated spaces, or whether the nearest monitored spaces are appropriate proxies for air quality in these spaces.

(2) **Most air quality data is reduced to daily averages when reported, and is measured at only a few locations** across the Chicago metropolitan area. This lack of spatial and temporal resolution in existing data sets forces researchers to inaccurately generalize pollutant levels across the region[i] and hinders attempts to assess the serious health impacts of pollutant fluctuation and build-up. Additionally, these measures obscure the importance of pollutant flux; respiratory clearance mechanisms are a stochastic system that responds slowly to changes in inhaled pollutant levels (8).

The Partnership's health-focused approach to urban air pollution demonstrates an effective response to environmental justice concerns by demonstrating the following principles:

1. Emphasis on **local-scale and temporal monitoring and analytic methods**.
2. **Creating and strengthening relationships** among physicians, (primary care providers and specialists), environmental scientists, NGOs, and community organizers and residents.
3. **Providing place-specific environmental information to community residents** in a manner that is readily understandable and directly related to the health risks posed to this area.
4. Enabling residents to better understand air quality patterns, allowing them to reduce their own exposure, to exert **greater control over local sources of air pollution**, and thereby of health and well-being in their own communities.
5. **Addressing cumulative risk** by accounting for a variety of factors that negatively impact the health and well being of an economically disadvantaged, medically under-served, and asthma-vulnerable community.

BACKGROUND

Asthma prevalence has increased across westernized societies over the past twenty years (11, 25), and currently affects approximately 5.5% of the U.S. population (12). In Illinois, asthma-related mortality has increased steadily since 1979 (13, 26), with hospitalizations due to respiratory distress also rising at an alarming pace, especially in Chicago. Over 48% of patient-days related to asthma occur within the City of Chicago (14). The Bronzeville/ Grand Boulevard community has disproportionately high levels of respiratory disease in comparison to other Chicago communities.

While differences in asthma prevalence between adult socioeconomic groups has been twofold or less (12, 15), differences in outcome have disproportionately affected communities and individuals of lower socioeconomic status, where hospitalization, death, and emergency department visits are substantially higher (16 - 21). This difference in outcome may indicate socioeconomic differences in healthcare access, options and education for asthma management, stress, exposure to environmental triggers, and a range of other indicators.

Concern over urban air pollution has increased in the Chicago Metropolitan area since the EPA designated the region as a non-attainment area for ozone pollution. In this community, regional air quality issues have been overshadowed by significant local sources, emissions from the adjacent Dan Ryan Expressway and particulates from demolition processes. The community currently lacks adequate information and data on these emissions, which heightens residents' experience of risk and weakens their ability to advocate for improvement.

1. Siting: Bronzeville and Environmental Justice

The Grand Boulevard community is situated in the Bronzeville area, located on the near southeast side of Chicago, extending from the Stevenson Expressway on the north to approximately 55th Street on the south, including the communities of Douglas, Grand Boulevard, and a significant portion of Washington Park. The entire neighborhood of approximately 77,000 residents is tucked into a relatively narrow strip of land between the Dan Ryan Expressway and Lake Michigan. Socioeconomic disadvantages, including lack of a strong business and service sector, environmental risk, abandoned and mismanaged lots, and low availability of medical services raise significant environmental justice concerns. Average income here is below $17,000 per year, and the majority of census have over 50 percent female-headed households.

Relationships between socioeconomic status and physical environmental factors received considerable research emphasis during the 1970's when major components of the U.S. environmental regulatory structure were developed (d-f). During the late 1980's and early 1990's, this line of investigation experienced a new impetus from the environmental justice movement. Most studies of air quality exposure differentials found that lower income groups and persons of minority racial background were exposed to higher concentrations of pollutants of various types, including varieties that may exacerbate asthma. Individual perception of environmental threat may also be a form of psychosocial stress (g), especially for persons with respiratory problems.

Health and well-being in the Bronzeville community

Meetings with Grand Boulevard community leaders and residents have revealed a deep concern over the increased prevalence of asthma and other respiratory diseases in this community, and about the lack of information available on local air quality. Residents have traditionally been concerned about particulate matter from the nearby Dan Ryan Expressway, and are now faced with further increases in particulate levels from the Chicago Housing Authority's on-going demolition of 30 high-rise (16 to 17-story) buildings in the neighborhood over the next three years. Most of the buildings to be demolished lie in a thin strip along the Expressway, are adjacent to buildings that will remain occupied throughout the demolition process. The Program Partners have identified this opportunity to assist the

community in mitigating exposure, and to investigate the potential health effects of short-term spikes in particulate air pollution over high ambient levels.

This focus on outdoor air quality has not yet been addressed in this community, and is extremely important due to this community's location between several major highways and industrial sources, with photochemical and meteorological effects acerbated by nearby Lake Michigan (See map on page 45). The fact that most air pollution in this community is generated by industry and by the activities of non-residents, via highway traffic, points to clear concerns for environmental justice.

The importance of improving this community's sense of control over environmental exposure during the demolition process can not be overemphasized. There is increasing scientific evidence of the important role of power in health and well-being,[ii] and it is becoming increasingly clear that the process of developing effective partnerships and attributing voice to community members is in itself a positive health benefit.

Significance to environmental health science research

Despite increasing scientific evidence pointing to the importance of local-scale air pollutant fluctuations (9, 24) and sources in affecting public health, there is currently little accessible community-scale air quality data, and even fewer affordable monitoring technologies available to gather this data, or epidemiological models for analyzing it. Currently, approximately 14 monitors maintained by EPA identify larger trends in air quality across the urban area, though little is known about shorter-term and smaller-scale fluctuations in air quality that can have great impact on the health and well-being of urban residents. Specifically, there exists little data on the quality of air in the places where people live, work, play, and breathe. Rush hour traffic, construction debris, and the redirection of winds around buildings can create significant short-term, spatially-specific changes in air quality that constitute repeated acute triggers for respiratory risk.

Similar to other cities with aging public housing developments, the accelerated pace of demolitions taking place in the Bronzeville community over the upcoming three to four years provide for a natural experiment in the health-related risk of short-term, localized spikes in particulate air pollution over high ambient particulate and ozone pollution levels. This research deals closely with the concept of thresholds, which have largely shaped environmental policy and research in this country, yet fail to account for the important effects of pollutant fluctuation and relative patterns in multiple pollutant exposure.

C. RELATED STUDIES

1. Urban Air Quality and Respiratory Health

Studies have repeatedly shown significant correlations between ambient air quality and respiratory effects including decreased lung capacity, respiratory irritation, inflammation, and bronchoconstriction (1). Poor air quality has also been related to increases in respiratory-related emergency room visits and mortality (2).

Particulate (PM10) levels have shown significant negative correlation with both same-day and next-day lung function (peak expiratory volume) (3). One British study showed PM10

levels to have significant correlation with all respiratory, cerebrovascular, and bronchitis admissions; the effect of a 10 microgram/ m3 rise in PM10 was estimated to represent a 2.4% rise increase in respiratory admissions, 2.1% increase in cerebrovascular admissions, and a 1.1% rise in all-cause mortality (2). The "Six Cities" study found, after adjusting for smoking and individual risk factors, a significant correlation between both particulate and sulfate air pollution with mortality from lung cancer and cardiopulmonary disease (4). Perhaps most interestingly, increases in PM10 levels have shown negative correlation with respiratory function (PEV) even at concentrations far below the 24-hour NAAQS standards (5).

2. Significance of Spatial and Temporal Variation in Air Quality to Respiratory Deposition

Recent studies point to the significance of short-term and small-scale changes in air quality to respiratory health. It has been shown, for example, that maximum decrease in airway capacity occurs between three and five hours following pollutant exposure (8), suggesting a significant temporal specificity in respiratory risk and pointing to the significance of temporal or short-term air pollution or emissions episodes bearing on respiratory health. Recent research on urban air pollution monitors shows low correlation between monitors, pointing to significant uncertainty about air quality levels between stations (9), potentially obscuring neighborhood-scale pollution patterns that may have bearing on the respiratory health of residents. A number of models allow for modeling the effect of environmental exposure on respiratory health. Deposition models allow researchers to assess the proportion of a given combination of air pollutants that actually impact a person's respiratory system, providing a crucial link between physical environmental quality and respiratory effect (a,b). These models demonstrate the importance of short-term concentration changes and cumulative deposition. Most air quality data, however, is collected on significantly longer intervals then hourly, and with inadequate spatial resolution to accurately identify specific patterns of risks.

A 1987 Canadian study revealed that school children living within the same small city could be annually exposed to levels of total suspended particulates that differ by location by a factor of 2:1, and to fine particulate levels differing by 1.5:1 (10). A study recently released by the Center for Disease Control and Prevention found that traffic controls in place during the 1996 Summer Olympic Games reduced the number of doctor visits and hospital admissions due to asthma attacks. This study emphasizes the significance of short-term and local-scale air quality changes to public health, showing that even in heavily industrial cities, peak pollutants levels correlate closely with traffic patterns, pointing to the high relative contribution of automobiles.

D. RESEARCH DESIGN AND METHODS

1. Research Objectives

Through this research process, the partnership aims to:

- Engage community residents in developing a research agenda, collecting data, disseminating results to health care providers and CHA decisionmakers, and performing environmental health education.

- Cooperatively *develop short- and long-range research agendas* to address community-specific issues of concern related to environmental exposure, access to health care, and availability of quality health information.
- Assist the community to *develop solutions and be involved in the policy-making for ameliorating pollution sources* and increasing access to informed health providers.
- *Assist the community and area healthcare providers* to better understand environmental indictors for health risk, such as air quality readings from local monitors.

2. Expected Findings

Hypothesis #1: Demolition activities have a statistically significant positive correlation with diurnal patterns in local ambient particulate air quality.

We expect to find a significant relationship between demolition activity and daily load shapes for PM. This would likely include:

- increased PM levels over the course of the day during demolition activity
- changed PM load shapes, reflecting key hours of PM emissions during demolitions
- increases in levels of criteria pollutants, including NO_x and ozone, from demolition equipment and trucks on-site.

Hypothesis #2: Diurnal (daily) patterns in local ambient particulate air quality have a statistically significant positive correlation with health effects among a susceptible population.

We expect to find:

- some increase in same day/ next day respiratory admission rates, number of asthma attacks and other short-term, tangible outcomes,
- some increased awareness and understanding of environmental exposure and health risk, possibly leading to improved mitigation practices,
- expect some potentially misleading indicators: ie., increased visits to pulmonary clinic may indicate better vigilance, or increased need/ incidence.

Additionally, we hope to show that small-scale pollutant patterns may be a stronger indicator for health outcomes than are current regional monitors and analyses of air quality based on daily averages rather than on diurnal patterns or pollutant flux.

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3. Research Methods

A. Collection of Environmental Data

1. Baseline Ambient Data

Ambient measures for key pollutants will provide a baseline for analysis of localized emissions data within the demolition area. Ambient data will include hourly regional measures for particulates (PM10), and non-PM criteria pollutants that impact respiratory health (including ozone, sulfur oxides, and nitrous oxides) to be collected from existing monitors maintained by EPA, the Lake Michigan Air Directors Consortium (LADCO), the University of Chicago, and Illinois Institute of Technology (33rd & Michigan). This ambient data will be corrected for hourly meteorological factors, which is collected at the two Chicago airports. Though this environmental and meteorological data lacks

geographic specificity, it can serve as an appropriate baseline for understanding pollutant concentrations in the Bronzeville community in comparison to the larger urban area.

2. Demolition Data Collection (Environmental Variable)

Particulate (PM-10) concentrations will be monitored on an hourly basis from four or more monitors ringed around each demolition site. Monitors will be situated to account for effects of winds on pollution dispersal patterns, following the recommendations of IIT students and researchers currently investigating geographical and meteorological concerns for air pollutant distribution in Bronzeville, and the recommendations of the community. Particulate monitors will be placed in agreed-upon locations surrounding demolition sites, and with particular attention to key community spaces including schools and parks.

Particulate monitors will operate hourly, on both working and non-working days, for several weeks before, during, and after each demolition. The monitors will be maintained and data collected on contract by CHA-hired environmental consultants who are already monitoring during demolition activity days. CHA, which is currently monitoring for respiratory dust, will adjust its monitoring protocol to capture PM10.

Localized non-particulate pollution data will be collected by IIT IPRO participants, using a "Portacount" particulate analyzer and several electrochemical sensors [for oxidants like CO and reductants like NO, NO2] that have been developed and built by IIT. IIT faculty will interpret the signals and determine the possibility of interferents such that erroneous interpretations will not be made from these data. The most important goal is that the sensor readings will reflect actual pollutant levels and changes therein so that this tool can effectively educate the public about air quality matters and lead to successful mitigation strategies.

The CHA will collect information regarding number of trucks used per day, per site, and the amount of rubble taken on each load. This information is useful in determining how the after affects of demolition affect health, (ie., how long the structural parts stay around the site). May involve residents in tracking of daily activities around demolition sites to aid in distinguishing PM effect of demolition itself from that of on-site trucks & equipment).

As most CHA buildings in this community are high- and mid-rise, their demolition process requires an average of three months per building. Each building is trashed, soft-stripped, with removal of all friable asbestos-containing materials. Once structural demolition begins, air monitoring for asbestos, lead, and respiratory dust is conducted. This monitoring, however, is only conducted during the day on weekdays and does not reveal information about the quality of the air that the residents breathe at other times.

The Partnership will supplement fixed monitor data with hand-held monitors for ozone. This effort is intended to engage the community in data collection, improve public understanding of environmental risk and distribution of pollutants, and creating an opportunity for high school science classes to use local environmental conditions as an opportunity for science lab exercises.

B. Collection of Health Outcomes Data

1. Cohort Study

Researchers will work with community organizations will recruit community members to participate in five rolling cohorts from throughout the community area. These cohorts will overlap over the length of the study, and will be designed to assess:

- health effects correlated to demolition-related PM levels,
- effectiveness of our outreach and education efforts throughout demolition process (ie: expect better preventative measures, outcomes in later cohorts),
- functional status measures (symptoms), quality of life measures for stress, and intervention and utilization. Control and individual stress factors are expected to have a significant effect on health outcomes in this study, as noise, truck traffic, safety concerns, and a lack of decision-making power, will effect residents throughout the demolition process.

Cohort participants will be pre-screened for longevity in the community and expectations to remain throughout the length of the cohort. CHA will be asked to confirm relocation schedules for participating residents from buildings to be demolished and in surrounding buildings. Cohort visits will begin in the area surrounding each site prior to the initiation of demolition activity, to establish individual baseline health indicators and to allow for early withdrawal from the study. A checklist will be given to participants to gauge how much they know about the demolition process and affects upon their health. Baseline data collected will include health histories and individual environmental triggers, including smoking habits, other smokers in the home, gas stoves, etc. Each cohort will aim for generous spatial distribution of residents around demolition sites, with a gradient to reflect proximity to sites with which resident live, work, play.

Prior to the establishment of this cohort study and the collection of utilization data described in the next section, researchers will employ techniques for pollutant distribution analysis, to identify the expected radius of demolition impact, and thereby to identify susceptible populations and accessible health services within the area.

2. Health Care Utilization and Quality of Care

Health utilization measures (including emergency room and clinic admissions data) will be collected from University of Chicago Hospitals, local clinics, and local hospitals participating in this study. This data will be used to indicate any changes in patterns of health care utilization, particularly shifts to clinics visits rather than ER visits, and other indicators of improved asthma management practices.

The database to be used for this portion of the study was provided by the Illinois Department of Public Aid (IDPA) Bureau of Budget and Analysis, and contains over 6 million records on prescriptions filed by over 84,000 Medicaid recipients with asthma. IDPA, the agency charged with administering Medicaid claims for the state, maintains multiple databases to tract the costs of providing data. Claims from FY 1996, 1197, and 1998 (July 1995 – June 1998) were screened and asthma-related claims were identified using DRG codes 096, 097, 098 for inpatient claims and IDC-9 codes 493.0-493.91 for outpatient claims. All patients with at east one claim coded with these identifiers were

included in the database. Claims for fiscal year 1999 are being screened by IDPA and will be included in this database, as well as subsequent years' data, as it becomes available.

The proposed research will incorporate the use of this Medicaid data to identify significant pre-existing spatial patterns of asthma occurrence and severity around pollutant sources in the Bronzeville area of Chicago. It will also be used to cross-reference self-reporting of asthma diagnoses and medication use where possible, and to correct for adequacy of asthma therapy in assessing impact of particulate pollution. To assess the relations, pharmacy claims data will be linked to data on claims for emergency room visits, inpatient hospitalization, and intensive care admissions. Time series analysis will be used to assess the association between specific outcomes and adequacy of therapy, using the ratio of beta-agonist use to total inhaled steroid use as a proxy measure.

C. Data Management

An automated data acquisition system will be set up to read air monitor data every hour. The method of delivering these data to our local network will be defined fully as we finish the design of the monitor network. However, we will use already existing remote-data-communication-systems such as cellular communications. The data will then be entered into an online database using MS SQL Server or equivalent relational database. These data will then be processed by a Cold Fusion Sever interfaced to a graphical Website.

D. Analysis of Data

Environmental data:

Ambient air quality data and particulate (PM) data from the demolition sites will be analyzed to assess the impact of demolition on daily particulate levels (averages) and daily load shapes. The additional increased PM levels over high background – effects above threshold levels). Chemical analysis of PM samples from the demolition will be performed by IIT. Frequency-domain and other statistical analyses will be performed to compare ambient pollutant levels across the community area, to compare these to ambient pollutant levels across the region, and to assess rates of change in diurnal and seasonal pollutant patterns.

Health Data*:*

Participants in the cohorts will be asked to keep a daily diary where they will record asthma attacks, how long were they outside that day, etc. A statistican will be hired to input that information into a database housed in the same computer as the environmental data. This data will then be analyzed for common factors influencing health and correlated to environmental data. Health outcomes data will be assessed for correlation of PM levels, following accepted lag models to account for time lags from exposure to health effect. Correlations will also be sought for cross-deposition of other criteria pollutants with PM, and researchers will investigate spatial distributions in this health data, as well as in the environmental data, with gradients to demolition sites.

4. Outreach and Involvement

Information complied from the six to twelve months of GBAC meetings, already held and ongoing, in addition to the health surveying in the community by the peer educators, will directly tailor the research plan, including pollutants to be monitored, health effects to be detected, and appropriate means of communicating our findings to the public. Air pollutant levels will be communicated in terms of level of risk to human health, by algorithms to be developed through CNT, U of C, and CDOH research, to emphasize health effects, to make measures relevant to the lives of community residents, and to advise residents on reducing harmful exposure.

- Reporting of timely environmental data via the Internet and on computers located in public libraries, schools, and the partner organizations. This reporting can assist residents to respond to changing pollutant levels, and to understand the correlation between air quality and urban activities including traffic and construction.
- As well as reporting this data, Program Partners will provide suggestions for mitigating air quality exposure on a website and in printed materials and educational sessions. Suggestions will include tips for reducing personal risk (i.e., scheduling indoor activities during concentration peaks) and for reducing air emissions (i.e., taking public transportation, walking, and refueling cars only in the evening).

Reporting of data results via internet and local reporting system
CNT will host the Bronzeville Air Quality Program webpage, including data links and analyses, on its website at http://www.cnt.org. The website will include daily postings of environmental data and analyses of recent trends (weekly and monthly), as well as a comparison to air quality readings in recent years and to regional levels. CNT's Geographic Information Systems (GIS) expertise will be used to map pollutant levels across the Bronzeville community area.

Although there is internet access available within the community at the Grand Boulevard Federation offices, public libraries, and schools, we will provide timely environmental information to residents through community postings, radio announcements, and eventually through electronic billboards or other real-time media. Data from air monitors will be reported to a central database and verified before posting to the community.

7. PROGRAM EVALUATION

Evaluation measures will be designed in the preliminary stages of research activity, and will be carried out throughout the research activity. Key evaluation questions will include the following:

1. Has the project demonstrated whether demolition activities have a positive correlation with diurnal (daily) patterns in local ambient particulate air quality?
2. Has the project demonstrated whether the spikes in particulate air pollution caused by demolition have a positive correlation with health effects among a susceptible population?

3. Has the project engaged a significant number of community residents in developing the research agenda, collecting data, disseminating results, and performing environmental health education?
4. Has the project educated local healthcare providers on environmental justice issues and the health risks of environmental exposures?
5. Has the project created and strengthened working relationships and partnerships among health providers and community residents?
6. Has the project provided place-specific environmental information to community residents in a way they find useful?
7. Has the project enabled residents and healthcare providers to understand environmental indicators for health risk, such as air quality readings from local monitors?
8. Has the project enabled residents and healthcare providers through better understanding and stronger partnerships to exert greater control over local sources of air pollution?
9. Has the project assisted the community to develop solutions to ameliorate the pollution problems?

A standard survey will be designed to reflect these indicators, and will be administered annually in the community. Results of the first year's survey will provide baseline measures, and results in subsequent years will provide indications of program effectiveness. To augment survey results, the evaluator also will conduct a handful of community interviews every six months. In addition, short evaluation forms will be passed out and collected at each community meeting to assess resident satisfaction with the meetings and project process.

Impacts on community action and health will be evaluated not only through interviews and surveys, but also through extensive use of the health data. The cohort health data will be used to assess improvements in health in later cohorts that may be related to the outreach and education efforts throughout the demolition process. The health utilization data will be used to assess changes in patterns of health care utilization.

8. Future applications/ Replicability

A. Research

This research program is highly applicable towards investigating:

(1) other demolition sites within Chicago (where several dozen high-rise buildings are planned for demolition within residential community in the upcoming five years), as well as other demolition programs across the country,
(2) other susceptible communities with high or increasing particulate levels, or short-term spikes in PM (the Bronzeville community provides an excellent case study of the effect of very high short-term spikes in particulate levels, over high background levels), and
(3) other sources of dust or particulate pollution.

This work builds on John Bailar's recent research by applying techniques from his Montreal study to examine correlation among ambient air quality monitors in Chicago (9), and to further investigate smaller-scale air quality fluctuations. A further investigation of correlation among air quality monitors across the Chicago region is an immediate research result of this project.

The U of C Asthma Center has examined asthma outcomes across Chicago's south side by mapping medication use and treatment. This work shows a greater geographic specificity than do asthma studies using hospital location as a proxy for geographic exposure. This research and expertise allows for a more rigorous analysis of localized, time-sensitive exposure with asthma medication use in the future.

B. Programs and Policy

This model for local-scale air quality monitoring is likely to demonstrate a general need for more geographically and temporally specific environmental data. Data obtained may directly affect Chicago Housing Authority policy and protocol for buildings demolition practices and techniques, as well as techniques for other significant public works that create airborne pollutants in the immediate vicinity of residents. The results from this study have the potential to influence future construction/demolition practices so that they minimize effects upon community residents.

Prior research has shown the greatest spikes in urban air pollutant levels to occur during and immediately after rush hour on any given weekday (24). We can anticipate that our community-scale air quality monitors and displays will reveal this trend, raising public awareness and concern over vehicular traffic in and around the community. This awareness may raise public support for transportation policies that emphasize accessibility to public transportation and cleaner transportation alternatives, including bicycle and pedestrian infrastructure, over vehicular transportation infrastructure.

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