

# ELPC Air Quality Monitoring Report

Hyde Park • 2017–19



**ENVIRONMENTAL LAW  
& POLICY CENTER**



**MAPSCORPS**



# Introduction

Air pollution is a serious threat to the residents of Chicago, but pollution levels can vary by neighborhood and even block-to-block. To understand airborne particulate matter pollution at the local level, the Environmental Law & Policy Center (ELPC) and community partners are conducting an air quality monitoring program to better understand neighborhood particulate matter concentrations.

The data in this report was collected in the Hyde Park community on the city's South Side from 2017-2019. Based on this data, we also provide policy recommendations from ELPC and our community partners to improve air quality and protect Chicagoans from dangerous air pollution.

## 1. What is Particulate Matter and Where Does it Come From?

Particulate matter (PM) is a highly toxic air contaminant composed of a mixture of fine carbon soot particles and gases that negatively impact human health and the environment.

Diesel exhaust is a major source of PM pollution in Chicago. It comes from heavy duty vehicles such as trucks and buses, and equipment such as construction machinery. Diesel combustion pollutes the air with harmful particulates in and around highways, rail yards, ports, intermodal facilities, and construction sites. Other sources of PM include cars, wood burning stoves, industry, agricultural burns, and forest fires.

As a transportation and economic hub for the nation, Chicago has a lot of diesel vehicles and heavy equipment activity. Residents who live and work near areas with high concentrations of PM pollution are at increased risk of adverse health effects.

## 2. Particulate Matter and Health

Fine particulate matter (PM<sub>2.5</sub>) can affect multiple systems in the human body. These microscopic particles are able to penetrate the natural defenses of the human body, become lodged in the lungs, and enter the bloodstream.

Long-term PM<sub>2.5</sub> exposure exacerbates asthma, chronic obstructive pulmonary disease (COPD), and other serious respiratory illnesses. It also has negative impacts on neurological systems, including impaired cognitive function, neurodevelopmental issues, and the potential for lifelong mental health problems.

The people most vulnerable to PM<sub>2.5</sub> include children, older adults, and those with respiratory illnesses. Children are at particularly high risk due to their underdeveloped lung function and capacity. Elderly folks are at high risk for aggravation of chronic respiratory and cardiovascular illnesses.

Even short-term PM<sub>2.5</sub> exposure poses a wide variety of health risks, including coughs, headaches, lightheadedness, nausea, aggravated allergies, increased risk of heart attack, and other cardiovascular trauma.

Asthma is the most common chronic condition among children, affecting one in ten nationwide. African American and Latinx children are more likely to be hospitalized or die from asthma related causes than Caucasian children.

Children's asthma rates are very high in Chicago, with asthma hospitalization at twice the national average and some neighborhoods seeing one in every three children affected. COPD and other respiratory illnesses and heart problems are also rampant in Chicago.

PM2.5 and its associated toxins are also detrimental to the environment, as they contribute to local smog formation and contain greenhouse gases that significantly accelerate climate change. The United States Environmental Protection Agency (USEPA) groups and classifies PM2.5 concentration levels by air quality ranges and levels of health concern, as shown in *Figure 1*.

### 3. ELPC Examines PM2.5 in Chicago's Neighborhoods

ELPC measures short-term PM2.5 using the AirBeam, a low-cost, open-source, handheld monitor manufactured by HabitatMap, a Brooklyn-based environmental health justice non-profit.

Despite its low cost, the AirBeam's measurements correlate well with the USEPA federal regulatory monitors (FRM). The AirBeam samples air at 1 second intervals and uses LED light-scattering technology to measure PM2.5 concentrations.

Since 2017, we have been using AirBeam monitors to teach residents to track air pollution, gain an understanding of their exposure to PM2.5, and make better-informed decisions to protect their health. Our program documents neighborhood air conditions by systematically collecting data in Chicago, primarily focusing on the South and West sides. With the help of amazing local partners, we have been able to collect over 12 million PM2.5 data points, which are analyzed and displayed on [AirQualityChicago.org](http://AirQualityChicago.org).

PM2.5	Air Quality Index	PM2.5 Health Effects	Precautionary Actions
<b>0 to 12.0 ug/m3</b>	Good 0-50	Little to no risk.	None.
<b>12.1 to 35 ug/m3</b>	Moderate 51 to 100	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
<b>35.1 to 55 ug/m3</b>	Unhealthy for Sensitive Groups 51 to 100	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.
<b>35.1 to 55 ug/m3</b>	Unhealthy for Sensitive Groups 51 to 100	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion; everyone else should limit prolonged exertion.

*Figure 1.* U.S. EPA particulate matter concentration level classifications.

# Monitoring in Hyde Park

ELPC works with two community partners in Hyde Park to collect particulate matter data in the summer. MAPSCorps is a Southside-based organization that trains youth to produce high quality data about community assets, and the Hyde Park Neighborhood Club (HPNC) is a childcare facility that offers productive and educational activities for Southside youth.

Each year fifteen teens participated in the monitoring program. Those teens were divided into three groups; each group was given an AirBeam monitor to collect data while asset mapping and answering research questions about their communities. Groups walked down sidewalks on most residential and commercial corridors from East Hyde Park Boulevard to 60th Street, between Cottage Grove and Promontory Point, as shown in *Figure 2*. Volunteers collected data between May and September, typically between 8:00am and 3:00pm in :

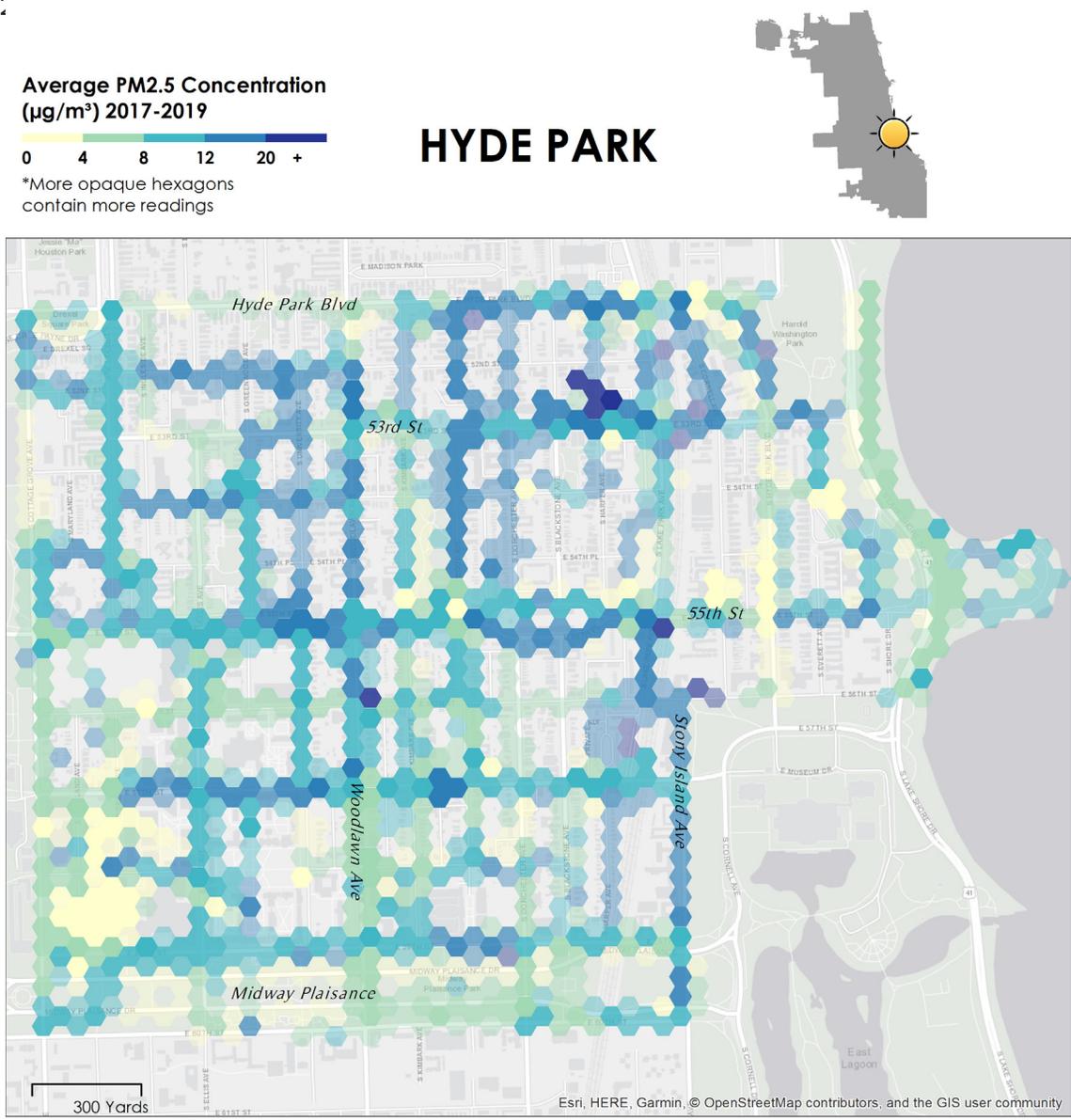


Figure 2. Average PM2.5 Concentration ( $\mu\text{g}/\text{m}^3$ ) in Hyde Park, 2017-2019

## Topline Results

As of Spring 2020, volunteers have collected 399,173 PM<sub>2.5</sub> data points in Hyde Park. Of that data, 79% fell into the “good” air quality range (0-12 µg/m<sup>3</sup>), 20% was “moderate” (12-35 µg/m<sup>3</sup>), and less than 1% was in the “unhealthy” categories (35+ µg/m<sup>3</sup>).

This means, for the majority of the time that volunteers were monitoring, the air was safe and posed little to no health risk. However, there were frequent instances of elevated particulate levels into the moderate and unhealthy categories. During those times, volunteers and local residents were breathing in air that was harmful to their health, especially those with respiratory illnesses such as asthma.

## Hyde Park Air Quality Data

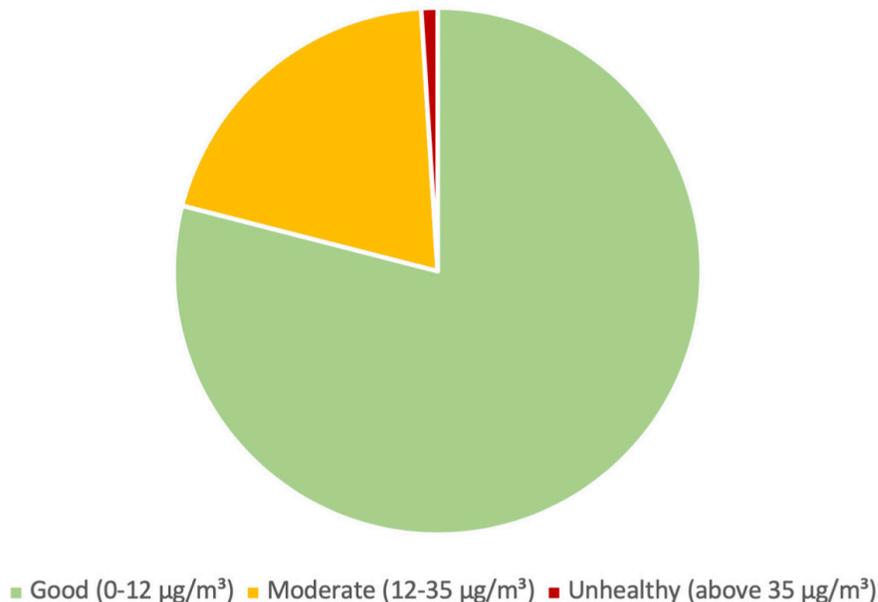


Figure 3. Average PM 2.5 concentrations documented in Hyde Park, 2017 - 2019

The box plots and line graphs below illustrate the PM levels that volunteers encountered while monitoring in Hyde Park. Box plots are used to show the range of PM encountered during an hour; outliers (the dots) show moments when PM levels exceeded the normal range for that hour. The line graphs illustrate the average PM levels experienced by hour. Locations where PM reached unhealthy levels are also noted.

## 2019 Hourly Breakdown

Volunteers collected 302,194 data points in 2019 during May and July, typically between 8:00am and 3:00pm (15:00). The box plot illustrates the range of PM<sub>2.5</sub> concentrations that volunteers encountered while collecting data. Unhealthy levels of PM<sub>2.5</sub> (above 35 µg/m<sup>3</sup>) were recorded at 10:00am and 11:00am, primarily at bus stops on 53rd, 55th, and 57th street.

Overall hourly exposures throughout the day were low and well within the healthy PM<sub>2.5</sub> range. Slightly higher concentrations in the morning dropped significantly at 12:00pm and remained low for the rest of the afternoon.

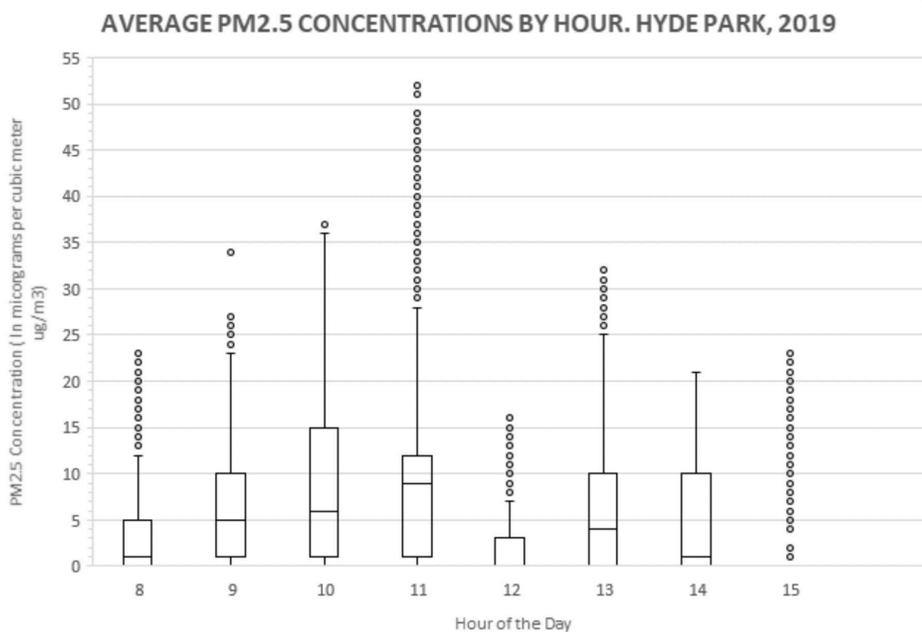


Figure 4. Summary box plots of PM<sub>2.5</sub> concentrations (ug/m<sup>3</sup>) by hour of the day.

## AVERAGE PM2.5 CONCENTRATIONS BY HOUR. HYDE PARK, 2019

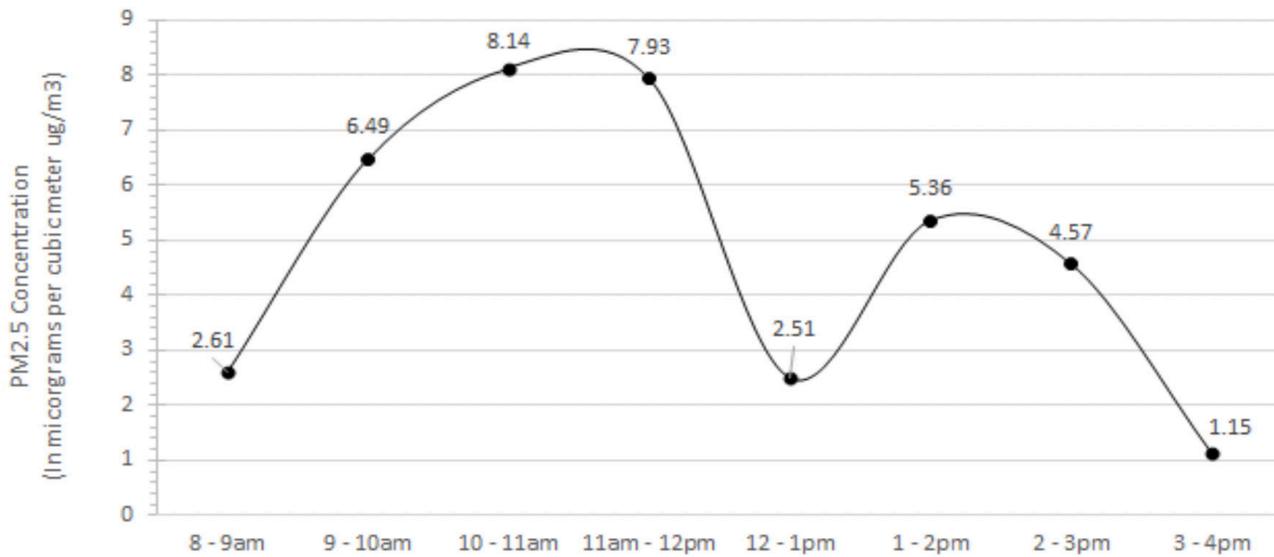


Figure 5. Average PM2.5 concentrations in Hyde Park, 2019 by hour of the day.

## 2018 Hourly Breakdown

Volunteers collected 41,110 data points in 2018 from July to August, typically between 9:00am and 3:00pm (15:00). The box plot illustrates the range of PM2.5 concentrations that volunteers encountered while collecting data. PM concentrations were higher in the beginning of the day. Volunteers recorded unhealthy readings (above 35  $\mu\text{g}/\text{m}^3$ ) at 9:00am, 10:00am, and 11:00am primarily at bus stops along 55th Street and Ellis Ave.

## AVERAGE PM2.5 CONCENTRATION BY HOUR. HYDE PARK, 2018

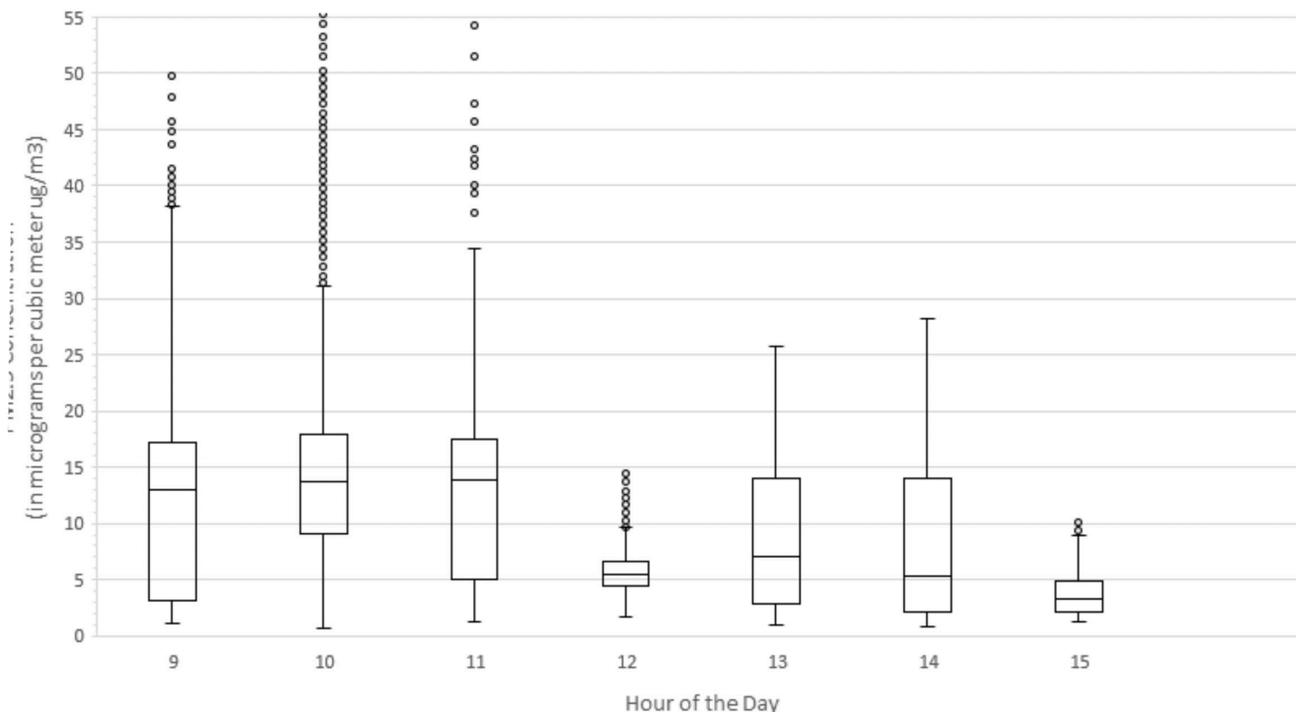


Figure 6. Summary box plots of PM2.5 concentrations ( $\mu\text{g}/\text{m}^3$ ) by hour of the day.

Overall, hourly exposures throughout the day were low, mostly within the healthy PM2.5 range. PM concentrations peaked around 10:00am with a moderate reading of 13.71 $\mu\text{g}/\text{m}^3$  and remained moderate until 12:00pm. PM levels remained low thereafter.

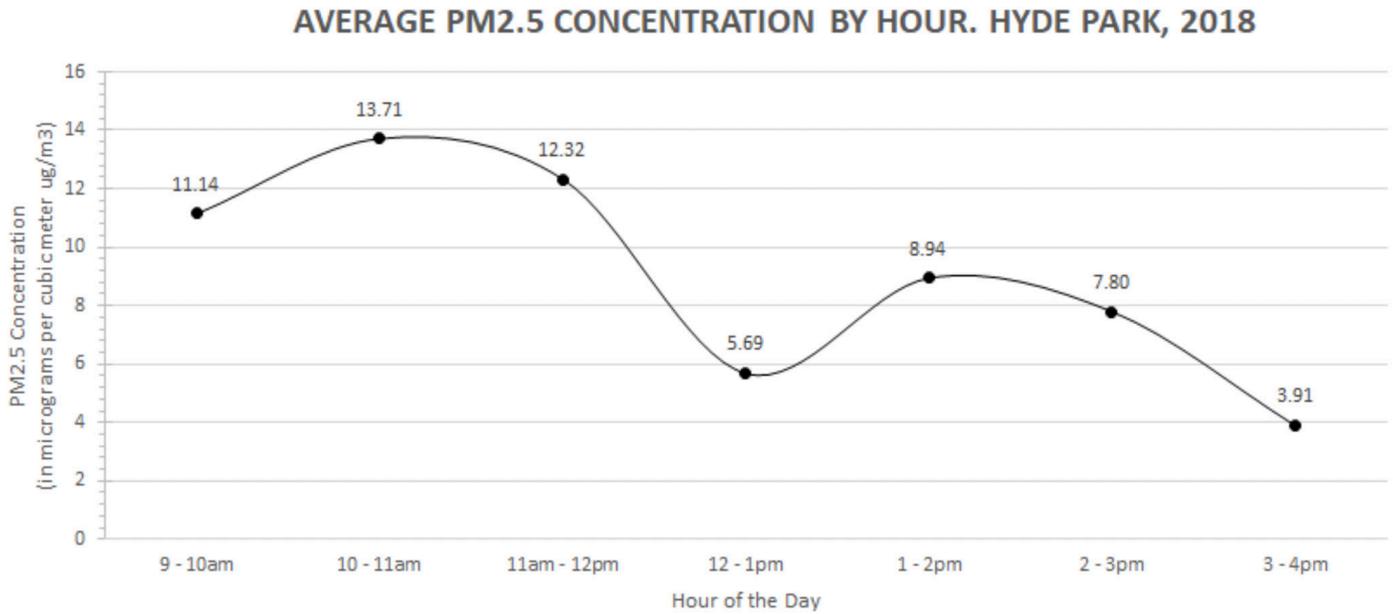


Figure 7. Average PM2.5 concentrations in Hyde Park, 2018 by hour of the day.

## 2017 Hourly Exposure

Volunteers collected 55,868 data points in 2017 from May to September, typically between 8:00am and 3:00pm (15:00). The box plot illustrates the range of PM2.5 concentrations the monitor volunteers encountered while collecting data. PM concentrations mostly ranged between good and moderate. Volunteers recorded unhealthy readings (above 35  $\mu\text{g}/\text{m}^3$ ) at 10:00am near bus stops and along the lakefront trail and again at 12:00pm along 59th street from Cottage Grove to Dorchester.

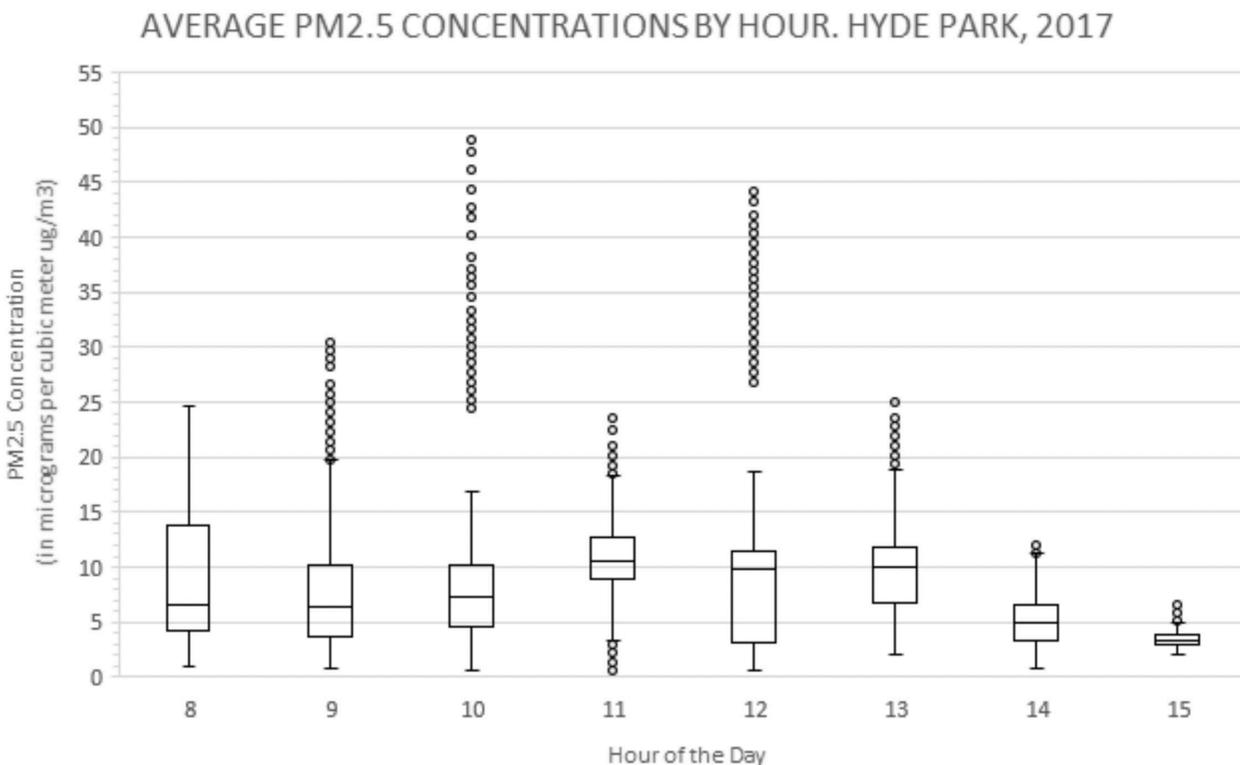


Figure 8. Summary box plots of PM2.5 concentrations ( $\mu\text{g}/\text{m}^3$ ) by hour of the day.

Overall, hourly exposures throughout the day were low and all within the healthy PM2.5 range. PM concentrations showed little variability in the monitoring, peaked at 11:00am with a reading of 10.10ug/m<sup>3</sup>, then began to drop in the afternoon.

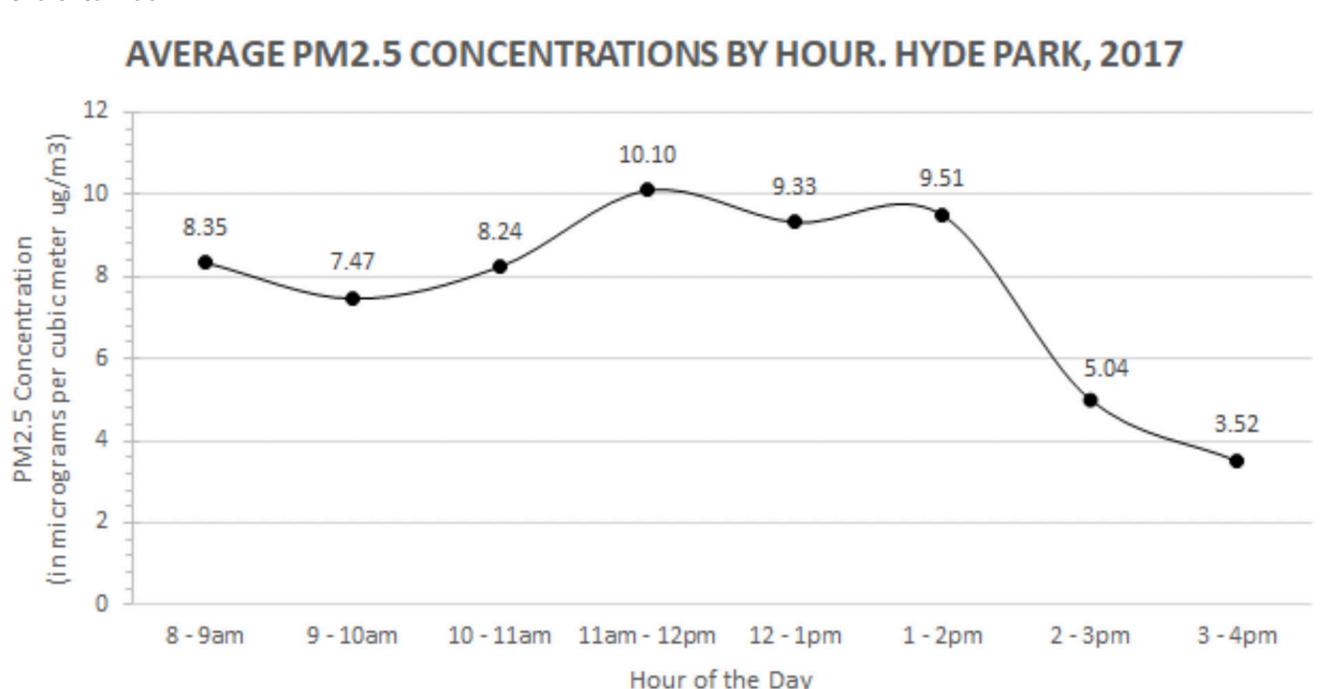


Figure 9. Average PM2.5 concentrations in Hyde Park, 2017 by hour of the day.

## Data summary

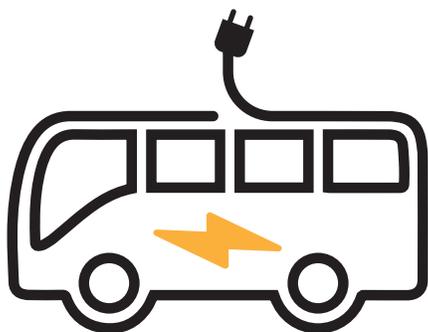
Hourly concentrations of PM2.5 remained relatively low throughout the day, but there were still corridors that experienced frequent elevated levels. Those areas include the eastern portion of East Hyde Park Boulevard, 52nd, 53rd, 54th, 55th, & 57th Streets, clusters around the Museum of Science and Industry along Stony Island, and areas around Harold Washington Park along Cornell Avenue and Hyde Park Boulevard.

As the AirBeam monitor takes a reading every second, it mimics the pattern of breathing. The map of Hyde Park highlights areas where 14% of the data (“hotspots” - the darkest blue) falls in the unhealthy category (above 35ug/m<sup>3</sup>). Thinking in terms of breathing, this means that in those dark blue areas, about one out of seven breaths was harmful to not only those who were monitoring but to those who work and live in those areas as well.

Volunteers found a greater prevalence of commercial vehicles in the late morning and early afternoon, an observation that lines up with the elevated PM levels documented during those times. Volunteers also noted that additional PM spikes also occurred near old CTA buses, busy commercial corridors (with lots of restaurants), idling, construction, and cigarette smoke. While monitoring in those areas, volunteers reported that the air caused aggravated asthma symptoms, coughing/wheezing, excessive thirst, tiredness, and the urge to go inside.

# Recommendations to Improve Air Quality

Monitoring air quality is just the first step in targeting opportunities for effective air improvement. After analyzing this preliminary data and conducting focus groups with those who monitored, ELPC and our community partners composed the following recommendations to protect residents from air pollution.



## CTA Electrification

Replacing diesel-powered buses with electric engines reduces not only harmful particulate matter pollution, but also greenhouse gas emissions. The City of Chicago has committed to electrify its fleet of 1800 buses by 2040, but the rollout so far has been slow. ELPC will work with HPNC and MapsCorps to ensure that the Chicago Transit Authority (CTA) carries out the city's goal swiftly.

Electric buses could be especially beneficial on routes where the data shows elevated PM levels, such as 55th, 59th, Woodlawn, and South Lake Park. ELPC is now sharing our air quality data with CTA officials, to help such priority decision-making. Also, ELPC policy fellow [Lucas Stephens testified](#) at a recent CTA budget hearing to emphasize the importance of electric buses for clean air across Chicago.

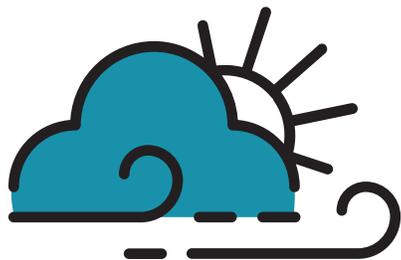


## Clean Construction

Most construction sites continue to rely on heavy-duty diesel vehicles, which emit toxic compounds and particulate matter, posing a great threat to respiratory health. Changing construction practices can reduce street-level particulate matter levels, benefiting both the workers and community residents. Clean construction utilizes cleaner equipment and idling limits to lower pollution at and near work sites. Zero-emission electric equipment and trucks are available already, and new models are continually coming to market. Chicago has a clean construction ordinance that applies to a subset of city projects, but neighborhoods could benefit from advocating for clean construction practices at all city and private developments.

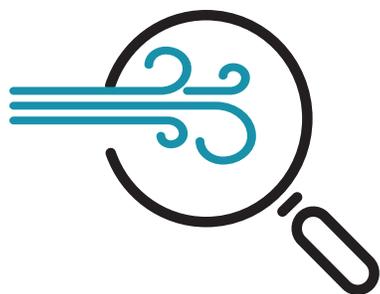
ELPC will work with HPNC, MAPSCorps, and other interested community partners to advocate for clean construction. Local opportunities include future University of Chicago projects, the Obama Presidential Center, and other neighborhood redevelopment.

## Federal Advocacy



Particulate Matter is a nationwide problem, which the U.S. EPA is tasked with regulating under its mission “to protect human health and the environment.” The EPA is required to update PM standards regularly, to reflect the latest scientific research, which continually shows more evidence of the dangers of PM exposure. Unfortunately, the EPA decided not to strengthen the PM<sub>2.5</sub> annual and 24-hour standards this year, despite the findings of career scientists and the recommendations of an independent 20-member panel of experts. ELPC field organizer [Tiffany Werner testified](#) before the EPA in June 2020 to highlight the impact of PM pollution on the Midwest and advocate for stronger standards.

## Continued monitoring



We have recorded the most consistent street-by-street data in Hyde Park, compared with other neighborhoods. ELPC will continue monitoring with MAPSCorps, HPNC, and other interested community partners. We will continue to focus efforts along major corridors and residential areas, as in previous years, with special attention to bus stops and intersections. The better we understand these PM hotspots, the better we can shape policy recommendations and advocacy.

In light of the COVID-19 situation, our air quality monitoring program had to function differently in 2020. Under Illinois’ stay-at-home order, we could not ask many of our traditional partners to leave their homes for non-essential trips. Youth could not gather in groups for collective air quality monitoring days.

For the 2020 season, we shifted to individual volunteer monitoring, encouraging safe social distancing, mask usage, and home-based air quality advocacy. Moving forward, should COVID-19 remain a threat to our communities, we are exploring other ways to collect data, such as stationary monitoring networks providing volunteers with planned routes focused on areas that need the most monitoring. With many of our long-standing partners, we are also working with them to analyze data, examine neighborhood hazards, and educate additional neighbors.

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## In Conclusion

Air pollution is an invisible killer. In a [recent study](#), researchers documented a 5% increase in PM<sub>2.5</sub> between 2016 to 2018, after years of decline. This increase in PM was also associated with 9,700 additional premature deaths. As the world faces a respiratory pandemic that has been disproportionately affecting communities with higher levels of particulate matter, leading to higher coronavirus death rates, it is even more important to understand and tackle the sources of air pollution that plague our city. While it may seem expensive to alter construction equipment or transportation vehicles, it costs us far more to do nothing. ELPC remains committed to protecting clean air and healthy communities in Chicago and across the Midwest.



## ENVIRONMENTAL LAW & POLICY CENTER

The Environmental Law & Policy Center is the Midwest's leading public interest environmental legal advocacy and innovation organization. We develop and lead successful strategic advocacy campaigns to improve environmental quality and protect our natural resources. We are public interest environmental entrepreneurs who engage in creative business deal making with diverse interests to put into practice our belief that environmental progress and economic development can be achieved together. ELPC's multidisciplinary staff of talented and experienced public interest attorneys, environmental business specialists, public policy advocates and communications specialists brings a strong and effective combination of skills to solve environmental problems.

ELPC's vision embraces both smart, persuasive advocacy and sustainable development principles to win the most important environmental cases and create positive solutions to protect the environment. ELPC's teamwork approach uses legal, economic, scientific and public policy analysis, and communications advocacy tools to produce successes. ELPC's strategic advocacy and business deal-making involves proposing solutions when we oppose threats to the Midwest environment. We say "yes" to better solutions; we don't just say "no."

ELPC was founded in 1993 after a year-long strategic planning process sponsored by seven major foundations. We have achieved a strong track record of successes on both national and regional clean energy development and pollution reduction, transportation and land use reform, and natural resources protection issues. ELPC brings a new form of creative public advocacy effectively linking environmental progress and economic development that improves the quality of life in our Midwest communities.

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