ENVIRONMENTAL LAW & POLICY CENTER

March 28, 2023

Submitted via Regulations.gov: Docket No. EPA–HQ–OAR–2015–0072

Reconsideration of the National Ambient Air Quality Standards for Particulate Matter

The Environmental Law & Policy Center appreciates the opportunity to submit written comments on the Environmental Protection Agency's proposal to update the National Ambient Air Quality Standards for $PM_{2.5}$ pollution. These comments supplement testimony offered at the public hearing held on February 22, 2023.

The Environmental Law & Policy Center (ELPC) is the Midwest's leading environmental legal advocacy and sustainability innovation organization. ELPC works throughout the Great Lakes states. Strong standards for $PM_{2.5}$, or soot pollution, are a critical issue in Chicago, Milwaukee, Detroit and across the Midwest Great Lakes region.

As EPA noted in announcing this proposal "Fine particles, sometimes called soot, can penetrate deep into the lungs and can result in serious health effects that include asthma attacks, heart attacks and premature death – disproportionately affecting vulnerable populations including children, older adults, those with heart or lung conditions, as well as communities of color and low-income communities throughout the United States."

Chicago, where ELPC is headquartered, is at the crossroads of most US truck and rail routes and is host to multiple intermodal facilities, where freight is transferred between diesel trains and diesel trucks. Many of our neighborhoods have also been bisected by the interstate system and as we've learned from public health studies, living near a major roadway constantly exposes one to air pollution, including small particulates.

ELPC has long-standing concerns about particulate matter (PM) sources and their contribution to respiratory health disparities like the high rates of asthma– especially among Chicago children. In some neighborhoods 1 in 3 kids are affected.

While we appreciate EPA's step to reconsider the PM standard, EPA missed the mark with this proposal. We urge EPA to finalize stronger standards that will deliver better health outcomes for those living in communities burdened by air pollution, including sensitive individuals like children and the elderly. Specifically, we call on EPA to finalize an **annual standard no higher than 8 µg/m³, and a daily standard no higher than 25 µg/m³ as well as stronger secondary standards as supported by the science.**

Air Quality Data Supports Stronger Standards

To support our call for stronger standards we have prepared a synopsis of two Chicago specific data sets:

- The first source is data from stationary sensors in Chicago, under the Project Eclipse Network, which is owned and operated by Microsoft. Since July 2021, this network has been continuously monitoring air quality in Chicago for three pollutants: $PM_{2.5}$, O_3, and NO_2. The network consists of over 100 stationary sensors.
- The second source is ELPC mobile monitoring data collected using AirBeam devices. These devices are low-cost, open-source, handheld particulate matter monitors that ELPC has been using to measure short-term $PM_{2.5}$ exposure in Chicago since 2017. Despite their low cost, these measures are in good agreement with USEPA federal regulatory monitors (FRM). The AirBeam measures the amount of $PM_{2.5}$ by taking air samples at one per second intervals (1 Hz).

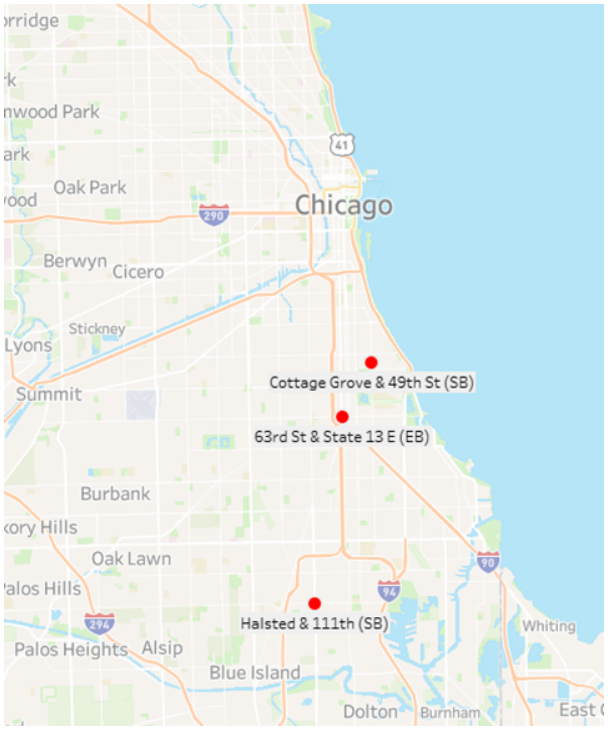
In this analysis, the recorded data from Microsoft stations helps capture the temporal variability of air quality in Chicago across different time scales, including daily and annually. Stationary sensors are ideal for measuring the temporal variability and long-term patterns of air pollution. However, due to the complexity of urban air pollution and the significant spatial variability it exhibits within communities, a vast number of stationary air quality sensors dispersed across the community would be necessary to map the fine resolution spatial variability of air pollution. Mobile monitoring can be used to measure pollution levels on accessible road networks in metropolitan communities, complementing stationary monitoring methods. ELPC, with partners, has been actively using this approach in areas of Chicago during the past six years.

Microsoft Stations Data Analysis

The Microsoft data is available via the Spatiotemporal Asset Catalog (STAC) API provided by Planetary Computer. We obtained the entire dataset of 122 stations in 2022, where 10.23 million data points were recorded. However, not all stations operated 100% of the time in 2022, and the percentages varied significantly. To minimize bias in our analysis, we retained only the data from the stations with operating hours over 90% in 2022, leaving us with 69 stations. We divided the analysis of these 69 stations into daily and annual periods.

Daily $PM_{2.5}$ Analysis

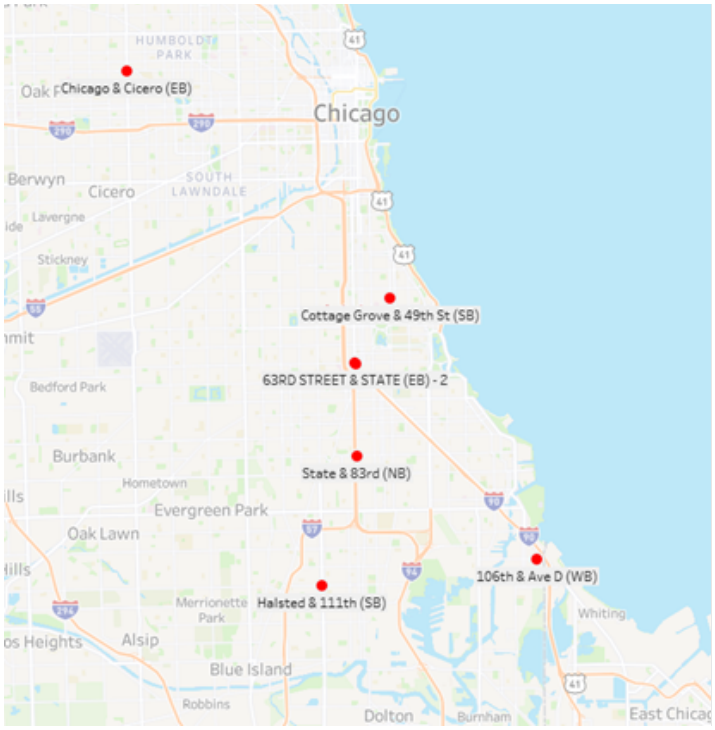
For the daily analysis, we calculated the daily $PM_{2.5}$ of all the stations and filtered those above the current daily threshold of 35 $\mu g/m^3$. Our results show that in 2022, three stations located in South Side Chicago exceeded this threshold on 50 days, all of which occurred in September and October. The map below shows the locations of these stations. Of concern is that on these 50 days, the $PM_{2.5}$ concentrations ranged from 68.9 to 226.4 $\mu g/m^3$, with an average of 175.75 $\mu g/m^3$, which is significantly above the daily threshold of 35 $\mu g/m^3$.



When we set the threshold to 25 µg/m³, we found that six stations experienced 215 days in 2022 with concentrations above this level. The months affected were March to December, with 185 of the days occurring between July and October. The table below shows the number of days above 25 µg/m³ in each month of 2022. The average PM2.5 concentration on these 215 days was 61.7 µg/m³, almost 2.5 times larger than the threshold of 25 µg/m³.

Month	*Number of Days Above 25 µg/m³*
4	*1*
5	*15*
6	*12*
7	*46*
8	*50*
9	*40*
10	*49*
12	*2*

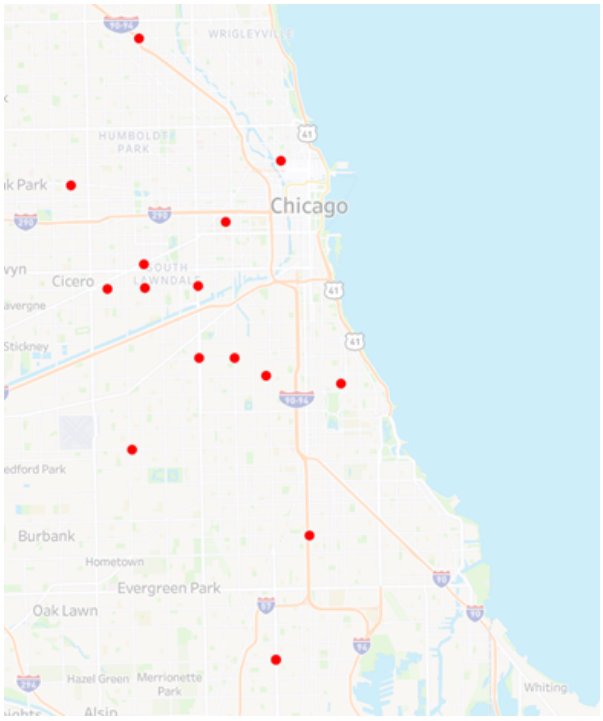
The map below shows that five of those stations are located on the South Side of Chicago, and one is on the West Side.



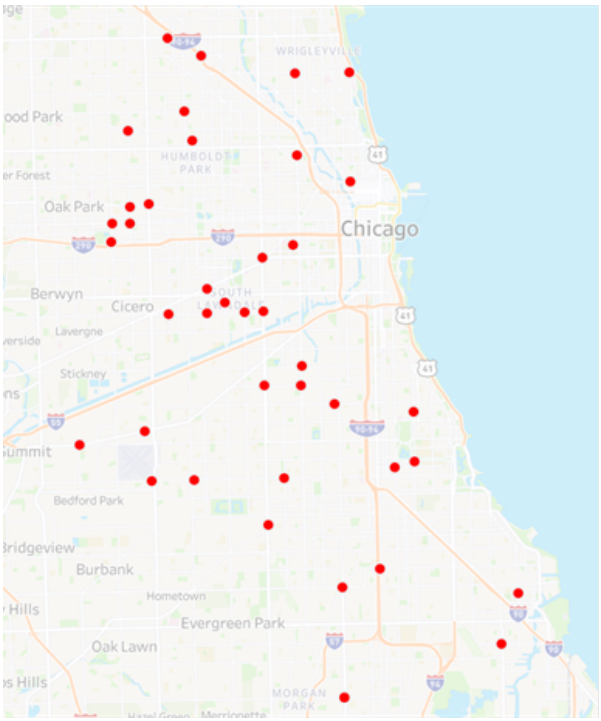
We further investigated the location of each station to determine the percentage of the population with incomes below the federal poverty level in the census tract in which each station is located. To do this, we obtained the most recently released American Community Survey (ACS) 5-year data from the Census Bureau's API for American Community Survey. The poverty status is based on income in the past 12 months of the survey. The results show that the population percentage below the federal poverty level for the Halsted & 111th (SB), 63rd St & State 13 E (EB), and Cottage Grove & 49th St (SB) stations are 15%, 43%, and 19%, respectively. For the other three stations above the 25 µg/m³ threshold, Chicago & Cicero (EB), 106th & Ave D (WB), and State & 83rd (NB), the percentages are 20%, 26%, and 7%, respectively.

Annual $PM_{2.5}$

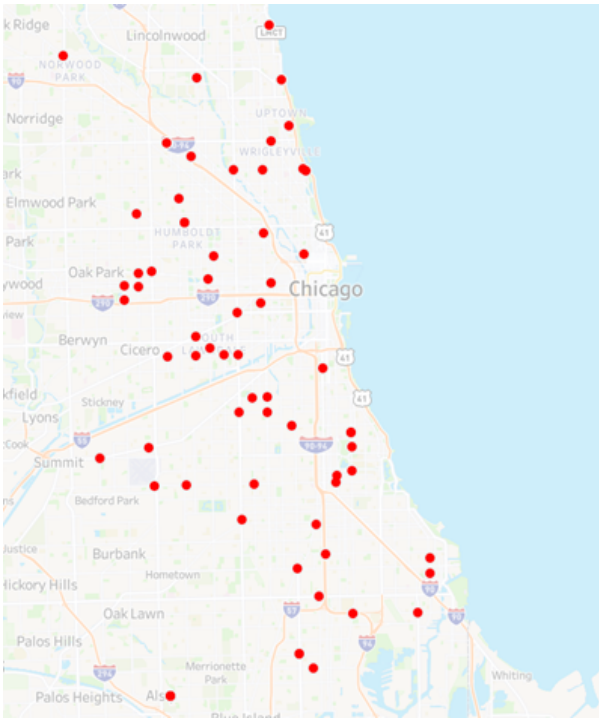
For the annual analysis, we calculated the $PM_{2.5}$ levels for all 69 stations with more than 90% operating hours. None of these stations had an annual $PM_{2.5}$ above the current threshold of 12 µg/m³. We then investigated the stations with annual $PM_{2.5}$ levels above 10, 9, and 8 and calculated the population below the poverty level for the census tracts they fall within. The results indicated that 16 stations had annual $PM_{2.5}$ levels exceeding 10. In the corresponding census tracts, a total of 76,100 people resided, with 4 to 42 percent living below the poverty level. On average, 19 percent of the population in these tracts was classified as impoverished.



For stations with annual $PM_{2.5}$ levels exceeding 9, a total of 41 stations were identified, encompassing a population of 156,580 within the corresponding census tracts. Among this population, 31,888 individuals, representing an average of 20%, were living below the poverty line. Nonetheless, the proportion of the population below the poverty level exhibited a wide range, varying from 3% to 68%.



For stations with annual PM2.5 levels exceeding 8, a total of 66 stations were found, accounting for a population of 252,039 within the corresponding census tracts. Of this population, 48,748 individuals, or an average of 19%, were living below the poverty line. Once again, the proportion of the population below the poverty level demonstrated considerable variation, ranging from 3% to 68%.



As can be seen from the above maps, the majority of the stations are located on the South and West Sides of Chicago.

In conclusion, although the average percentage of the population living below the poverty level in the mentioned scenarios is approximately 20%, there are numerous tracts where over 40% of the population, and even one with 68%, reside under the federal poverty level. **Consequently, when establishing national thresholds for daily and annual $PM_{2.5}$ levels, it is essential to prioritize the most vulnerable areas as the baseline. By doing so, other communities will inherently benefit as well.**

ELPC Air Quality Monitoring Project

ELPC initiated a community science air quality monitoring project and partnered with neighborhood residents, community organizations, and students, to conduct air quality monitoring, collecting and mapping small particulate levels. Our partners were concerned about their air quality and wanted access to data. To conduct this project, we used AirBeam monitors to

collect 10.5 million data points over the course of the 5 years. We observed that the city's $PM_{2.5}$ levels are not even across the area. We saw higher levels on major transportation corridors, especially those with regular diesel truck traffic. Sadly, but not surprisingly, the maps of Chicago's poverty, pollution sources, poor health, and death rates from COVID 19 all look the same: communities on the south and west sides show higher levels of all four.

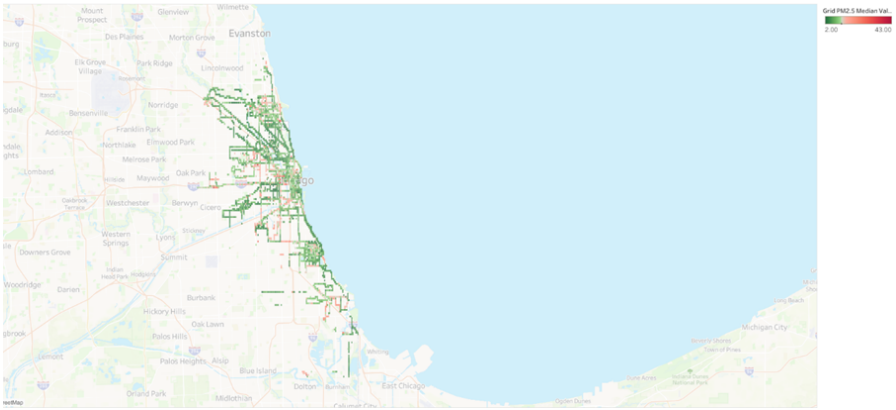
This health disparity and environmental justice situation is not unique to Chicago. A recent story covered the health impacts of living near highways and sources of soot pollution in Minnesota.

ELPC Air Quality Data Analysis

Understanding the number of repeat visits necessary to obtain a meaningful approximation of the spatial air quality pattern in a specific area is a crucial question in mobile monitoring. Using data from Microsoft stations, we developed a comprehensive method to calculate the number of Chicago-specific sampling repeats necessary for mobile air quality monitoring. Our findings suggest that, on average, the error percentage after five hours of sampling is within an 11% range of the annual PM2.5 levels of the locations. For samples with a size of 10 hours or greater, the error percentage remains below 9%. For samples of 15 or greater, the error stays below 7%, and after 30 samples, the error remains below 5%.

We utilized our findings to analyze the data from ELPC's mobile air quality monitoring by creating rectangular grid cells of 420 by 680 feet, which is the average block size in Chicago. We then matched the points of the air quality measurement layer to the target grid cell polygon output layer. For each grid cell, we counted the number of unique measurement days and computed the median $PM_{2.5}$ value of all the measurements. We excluded grid cells with less than five unique days since there were insufficient measurements to accurately characterize the air quality in those cells. The remaining grid cells were classified into four easy-to-understand categories based on the number of unique days: between 5 to 9 was labeled as "Unconfident" - a good start, but additional sampling days are needed; between 10 to 14 was labeled as "Relatively Confident" - very close, but a few more sampling days are needed; between 15 to 29 was labeled as "Confident" - does not necessarily require more sampling, but if done, it will be very confident, and 30 and above was labeled as "Very Confident" - no further sampling is needed.

The final interactive map can be accessed here: Interactive map, and below is a screenshot of the map, showing the areas covered during our monitoring program.



Here are some specific findings from our analysis of our data as it relates to EPA's proposal for an annual standard of 10 µg/m^3. While Chicago has a total land area of 234.5 square miles, we monitored in/covered 36 square miles, or 15.2% of the city. Currently, 19.5% of the area we covered is above 12 micrograms per cubic meter. If the threshold is set to:

- 10 µg/m^3 - 31% of the covered area would be above the standard
- 9 µg/m^3- 41.5% of the covered area would be above the standard
- 8 µg/m^3- 48.4% of the covered area would be above the standard

If we assume for simplicity that the population is evenly distributed, by dropping the threshold from 12 to 10 as proposed or lowered to 9, or 8, as both ELPC and the science support, the covered area and subsequently the exposed population (i.e., those exposed to levels at or above the primary standard) will be 1.6, 2.1, and 2.5 times larger than under the current standard.

In short, a stronger PM standard will impact a greater area, more people and help to ultimately drive down soot pollution when standards are translated into implementation.

Conclusion

In summary, ELPC joins partners across the environmental and public health communities in calling for an annual standard no higher than 8 µg/m^3, and a daily standard no higher than 25 µg/m^3 as well as stronger secondary standards as supported by the science. We believe both primary and secondary standards should be strengthened in a final rule to improve air quality for everyone, but specifically to ensure more is being done to protect vulnerable communities, especially Black, Brown, and low-income communities most exposed to sources of $PM_{2.5}$ in the Midwest and across the U.S.