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# CITY OF CHICAGO

## Air Quality and Health Report

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2020

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# Background

Mayor Lori Lightfoot is committed to advancing environmental justice and addressing the city's most pressing environmental challenges. From the [Chicago Climate Action Plan](#) to [Sustainable Chicago 2015](#), Chicago has been on a path to improve the quality of life for local residents, mitigate sources of pollution, and reduce the impacts of climate change. Central to these citywide efforts is recognizing that low-income communities and communities of color are disproportionately impacted by air pollution.

Chronic disease is the leading driver of Chicago's nine-year life expectancy gap between Black and white residents and decreases in life expectancy in the Latinx population. Air pollution can both increase risk of chronic illnesses like heart and lung diseases and contribute to worse outcomes for people living with certain health conditions. We must ensure that our environmental policies are focused on communities where residents are at highest risk.

This brief outlines how the Chicago Department of Public Health (CDPH) analyzed community-level data on air quality, health, and social factors to identify, for the first time, which neighborhoods must be prioritized for efforts to mitigate and reduce air pollution. In developing this report, we consulted with subject matter experts, advocacy groups, and community-based environmental justice organizations. We hope this analysis will serve as a resource for the City, researchers, advocates, residents, and other stakeholders in their continued efforts to take action on environmental health.

Our work builds on the City's commitment to health and racial equity through [Healthy Chicago 2.0](#) (and the upcoming Healthy Chicago 2025 plan), [Resilient Chicago](#), and initiatives led by local environmental justice organizations. The findings will help inform City decision-making and proactive planning – but this analysis is only a starting point. We expect to refine our methods and data sources over time, in close collaboration with community partners and other experts.

## AIR QUALITY IN CHICAGO

Due to federal efforts such as the Clean Air Act and local efforts such as cleaner City fleets and sustainable development practices, overall air quality in the Chicago area has improved over time.<sup>1</sup> Still, we have more work to do to ensure that all residents are breathing clean air.

There are a few key facts demonstrating air quality issues in Chicago. First, Cook County does not currently meet the federal standard for ozone.<sup>2</sup> According to the American Lung Association's 2019 "State of the Air" report, the Chicago area has seen an increase in days with high levels of ozone-polluted air – up to a yearly average of fifteen "unhealthy ozone days" from 2016-18, making Chicago the 16th most polluted city in the U.S. for ozone, up from 18th last year and 26th in 2017.<sup>3</sup> Additionally, fine particulate matter pollution remains high in Chicago. Although the Chicago area meets federal standards for fine particulate matter (PM<sub>2.5</sub>) pollution and levels have decreased by 40% since 2000, concentrations are still among the highest in the nation.<sup>4,5,6,7</sup>

<sup>1</sup> US EPA Air Quality – National Summary available at <https://www.epa.gov/air-trends/air-quality-national-summary>.

<sup>2</sup> US EPA Green Book, 8-Hour Ozone (2015) Designated Area/State Information available at <https://www3.epa.gov/airquality/greenbook/jbtc.html>.

<sup>3</sup> American Lung Association State of the Air 2020 available at <http://www.stateoftheair.org/assets/SOTA-2020.pdf>.

<sup>4</sup> See 78 FR 48103

<sup>5</sup> We would note that designations are based on average concentrations in a geography that includes parts of Indiana and suburban collar counties. The current NAAQS standard for fine particulate matter is 12 ug/m<sup>3</sup>, which is under review by the EPA.

<sup>6</sup> American Lung Association State of the Air 2020 available at <http://www.stateoftheair.org/assets/SOTA-2020.pdf>.

<sup>7</sup> See US EPA EJ Screen Mapper available at <https://ejscreen.epa.gov/mapper/>



## HOW AIR QUALITY AFFECTS HEALTH

Air pollution is harmful to Chicago residents' health and quality of life. Exposure to pollutants such as ozone and PM<sub>2.5</sub> is associated with increased risk of lung irritation, respiratory problems, cardiovascular disease, asthma, cancer, and early death. PM<sub>2.5</sub> pollution, which can penetrate deep into the lungs, is particularly damaging. Our estimates suggest that 5% of premature deaths in Chicago each year can be attributed to exposure to PM<sub>2.5</sub>.<sup>8</sup>

Communities with low socioeconomic status and high rates of chronic health conditions are especially vulnerable to the impacts of air pollution. In Chicago, with its history of segregation and disinvestment in Black and Latinx communities, the differences between neighborhoods can be stark. Some communities have rates of poverty, cardiovascular disease, and chronic obstructive pulmonary disease (COPD) that are ten times greater than others. Structural racism and economic hardship contribute to this gap, making it more likely for certain people to live in polluted communities and less likely to have access to health care and good jobs that can mitigate negative impacts.<sup>9</sup>

## DATA AND METHODS

To evaluate community-level vulnerability to pollution across Chicago, CDPH followed the methodology of the CalEnviroScreen 3.0, a report created by the California Environmental Protection Agency. We modified the methodology to account for Chicago's circumstances, including different limitations on data access and our initial focus on air quality.<sup>10</sup> We analyzed existing public data in the following categories at the census block group level (see Appendix for more details on data sources):

### •Pollution Burden

- Air Pollution:** Estimated concentrations of outdoor air pollutants. Indicators include particulate matter, ozone, diesel particulate, air toxics, and traffic proximity and volume.<sup>11</sup>
- Polluted Sites:** Adverse environmental conditions caused by pollutants such as existing or potential contamination. Indicators include proximity to hazardous waste facilities and Superfund sites.<sup>12</sup>

### •Population Characteristics

- Health Factors:** Biological and other physical characteristics that make people more likely to experience adverse health impacts from exposure to air pollution. Indicators include young and old age and prevalence of COPD, heart disease, asthma, and low-birth weight.<sup>13</sup>
- Social Factors:** Socioeconomic characteristics that result in increased vulnerability of some populations to air pollution. Indicators include poverty, race/ethnicity, education, limited English speaking, unemployment, and housing cost burden.<sup>14</sup>

<sup>8</sup> Estimated using methodology from Burnett R et al. *Global estimates of mortality associated with long-term exposure to outdoor fine particulate matter*. PNAS 115(33): 9592-7, 2018 <https://www.pnas.org/content/115/38/9592#T1> and local data from US Census and Chicago Health Atlas.

<sup>9</sup> American Lung Association, Disparities in the Impact of Air Pollution available at <https://www.lung.org/our-initiatives/healthy-air/outdoor-air-pollution/disparities.html>

<sup>10</sup> We also reviewed the methods for the NRDC Cumulative Burden Map

<sup>11</sup> EPA EJScreen (2019).

<sup>12</sup> EPA EJScreen (2019).

<sup>13</sup> CDC 500 Cities (2017) IDPH Division of Vital Records (2013-2017).

<sup>14</sup> US Census Bureau (2011-2015).



For each census block group, we calculated an Air Quality and Health Index score by following the steps in the table below. The score tells you which areas of Chicago are most vulnerable to the effects of air pollution, based on pollution burden and population characteristics.

1. Calculate the block group's score for each of the 21 individual indicators shown in the Appendix.				
2. For each indicator, rank the block group compared to all others in Chicago.				
3. Calculate average rank of all indicators within a category's components.	<b>Pollution Burden Category</b>		<b>Population Characteristics Category</b>	
	Average rank for all <b>Air Pollution</b> indicators = Score A	Average rank for all <b>Polluted Site</b> indicators = Score B	Average rank for all <b>Health Factor</b> indicators = Score C	Average rank for all <b>Social Factor</b> indicators = Score D
4. Calculate an average score for the category.	$(\text{Score A} \times \text{Score B} \times .5) / 2 = \text{Score E}$ <i>Note: Polluted Site score is half-weighted because it reflects potential (not actual) exposure.</i>		$(\text{Score C} \times \text{Score D}) / 2 = \text{Score F}$	
5. Scale each category score relative to the census block group that has the highest score in that category.	$(\text{Score E} / \text{Highest Block Group Score}) \times 10 = \text{Score G}$		$(\text{Score F} / \text{Highest Block Group Score}) \times 10 = \text{Score H}$	
6. Multiply the scaled category scores. Result is the Air Quality and Health Index Score for the block group.	$\text{Score G} \times \text{Score H} = \text{Air Quality and Health Index Score}$			
7. Rank all block groups based on their Air Quality and Health Index scores.				

To see detailed maps and learn more about our methods and underlying data, the **Air Quality and Health Data Pack** is available here ([link](#)).

## WHAT DID WE FIND?

The concentrations of certain types of air pollution such as particulate matter and ozone are fairly uniform across the city. Pollutants such as diesel particulate matter, on the other hand, are more prevalent in areas with significant traffic and industry. Additionally, health and social factors that make some people more vulnerable to the effects of pollution vary widely from one neighborhood to the next.

We visualized the pollution burden and population characteristics indicators in a map, with red representing the highest (worse) and green the lowest (better) Air Quality and Health Index scores. **The resulting map shows that the areas of greatest concern are primarily located on the South and West Sides of the city. In particular, parts of the city bisected by major highways with high concentrations of industry are over-burdened, experiencing high levels of both pollution and vulnerability.**

To inform interventions, future data analysis will attempt to drill down into the types of activities and businesses that may be contributing to air pollution, using sources such as an inventory of annual emissions reports.



## DATA LIMITATIONS

The Air Quality + Health Index map displays differences in the scores for each category by census block group compared to the scores for all other census block groups in Chicago. As such, it may magnify small differences. Additionally, some of our data sources have a substantial time lag. For these reasons, the map should not be used on its own to attribute sources of pollution or to make regulatory or enforcement decisions. We continue to work with experts and community scientists to explore innovative sources of more real-time data.

## NEXT STEPS FOR THE CITY OF CHICAGO

The City of Chicago is committed to systematic regulatory reform aimed at mitigating air pollution and protecting our communities, particularly those located near areas zoned for heavy manufacturing and Planned Manufacturing Districts (PMDs). The road to reform will begin with an exploration of the gaps in our policies and regulations. After identifying these gaps, the City will pursue updates to our zoning code, operating rules, permitting processes, and enforcement efforts. These reforms will be informed by public health data to help us understand conditions on the ground and the cumulative impacts of multiple sources of pollution. The strategy will also prioritize the proposals of advocates, community leaders, and community stakeholders who have local knowledge and expertise on how pollution impacts Chicago's neighborhoods.

Our reforms are part of Mayor Lightfoot's larger environmental vision to confront the city's most pressing environmental challenges, including legacy pollution left behind by former under-regulated industries, ongoing air pollution, and the compounding impacts of climate change, including several short-term changes:

**Large Recycling Rules:** The City released updated rules for large recycling facilities that became effective in June 2020. The rules incorporate a number of significant requirements, including air and noise assessment and monitoring, as well as other measures to minimize dust and pollution. These rules now are a condition for continued permitting of facilities and are enforceable through CDPH citations.

**Zoning Ordinance:** The City will pursue a zoning text amendment ordinance that will impose special use and Planned Development (PD) requirements for certain land uses, including manufacturing operations and recycling facilities. By shifting these heavy land uses from as-of-right developments to special use, we are ensuring a more stringent process to review where these intensive uses are located. The ordinance will also eliminate other uses such as mining operations, thereby permanently closing the door to their use in the City of Chicago.

**Environmental Equity Working Group:** The City will convene a board of community representatives, environmental leaders, and other local stakeholders who will advise the reform agenda.

Our additional steps in carrying this commitment forward will also include:

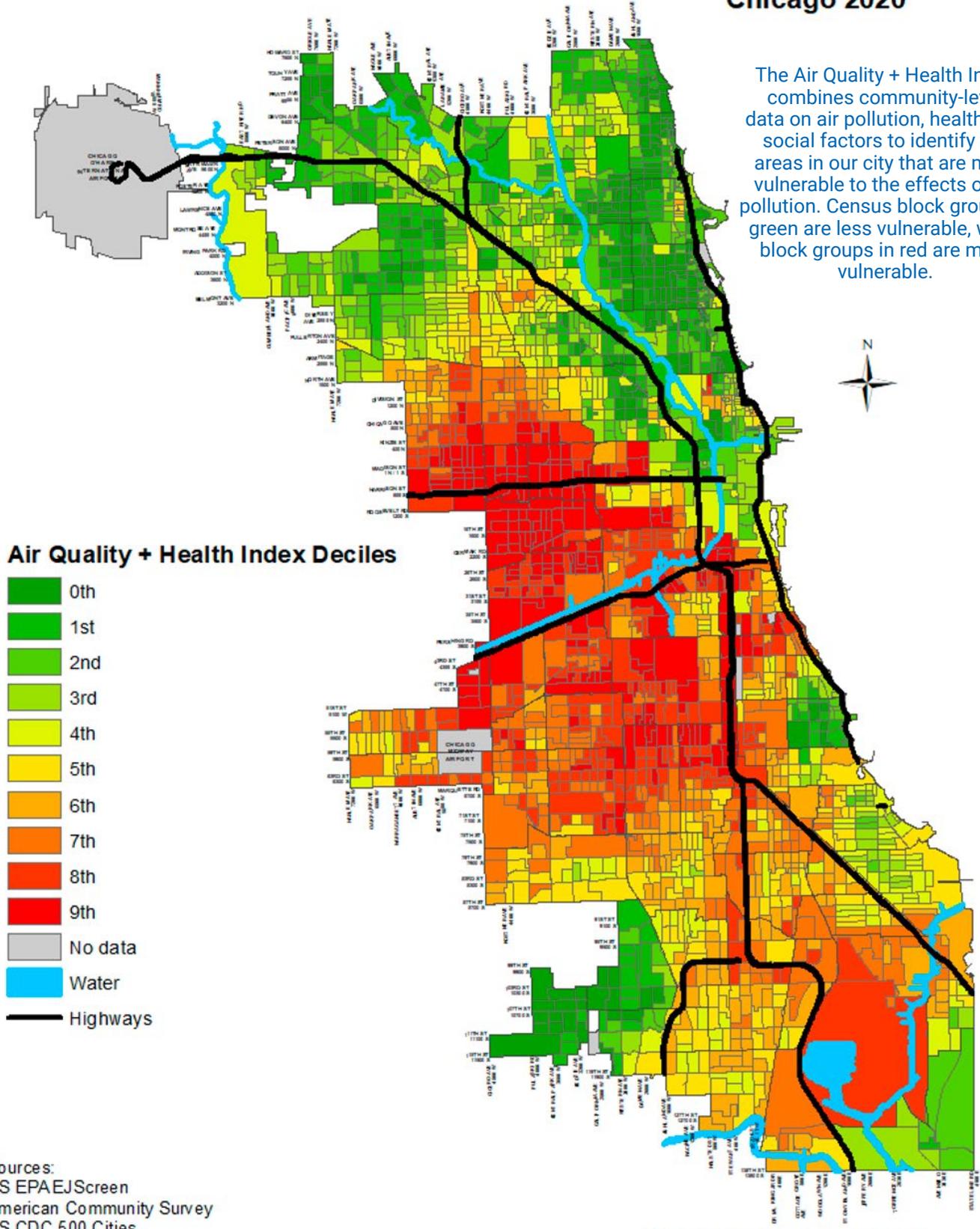
1. **Industrial Business Rule Reform:** Review and revision of other operating rules for industrial businesses.
2. **Cumulative Burden Analysis:** Development of an ordinance requiring new and more stringent permitting requirements to prevent cumulative burdens from disproportionately affecting certain neighborhoods.
3. **Enforcement and Inspection Reform:** Evaluation and updates to the current processes.

Collectively, these reforms will improve air quality citywide and better protect communities that are most affected by pollution - making us a healthier Chicago.



# Air Quality and Health Index, Chicago 2020

The Air Quality + Health Index combines community-level data on air pollution, health, and social factors to identify the areas in our city that are most vulnerable to the effects of air pollution. Census block groups in green are less vulnerable, while block groups in red are more vulnerable.



Sources:  
 US EPA EJScreen  
 American Community Survey  
 US CDC 500 Cities  
 IDPH Vital Statistics  
 Various years combined, 2011-2018

Created by Office of Epidemiology,  
 Chicago Department of Public Health, January, 2020



## APPENDIX: AIR QUALITY AND HEALTH INDICATOR LIST

CATEGORY	INDICATOR	YEAR	SOURCE
Health Factors	Asthma Prevalence	2017	CDC 500 Cities
	COPD prevalence	2017	CDC 500 Cities
	Coronary Heart disease prevalence	2017	CDC 500 Cities
	Low birth weight	2013-2017	Illinois Department of Public Health Vital Records
	Young Age	2013-2017	American Community Survey via EJSCREEN 2019
	Old Age	2013-2017	American Community Survey via EJSCREEN 2019
Social Factors	Percent Low Income	2013-2017	American Community Survey via EJSCREEN 2019
	Percent Minority	2013-2017	American Community Survey via EJSCREEN 2019
	Percent less than high school education	2013-2017	American Community Survey via EJSCREEN 2019
	Linguistic isolation	2013-2017	American Community Survey via EJSCREEN 2019
	Unemployment	2013-2017	American Community Survey via EJSCREEN 2019
	Housing burdened low income households	2013-2017	HUD CHAS from American Community Survey
Air Pollution	Particulate Matter	2016	EPA Office of Air and Radiation via EJSCREEN 2019
	Ozone	2016	EPA Office of Air and Radiation via EJSCREEN 2019
	Diesel Particulate Matter	2014	National Air Toxics Assessment via EJSCREEN 2019
	Air Toxics Cancer Risk	2014	National Air Toxics Assessment via EJSCREEN 2019
	Air Toxics Respiratory Hazard Index	2014	National Air Toxics Assessment via EJSCREEN 2019
	Traffic Volume and Proximity	2017	US Department of Transportation traffic data via EJSCREEN 2019
	Proximity to Risk Management Plan (RMP) sites	2019	EPA RMP database via EJSCREEN 2019
Polluted Sites	Proximity to Hazardous Waste Treatment, Storage, and Disposal Facilities	2019	EPA RCRAinfo database via EJSCREEN 2019
	Proximity to National Priorities List, Superfund Program sites	2019	EPA CERCLIS database via EJSCREEN 2019







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