The Natural Resources Defense Council (NRDC) has developed a methodology to understand and describe, for the city of Chicago, the cumulative burden of harmful environmental exposures and factors that can make a population more vulnerable and susceptible to those exposures. The current version of NRDC's cumulative impacts methodology utilizes a quintile ranking method adapted from Sadd et al.'s Environmental Justice Screening Method (2011) and applies it to the USA EPA's EJSCREEN data. This method was chosen as a basis for our analysis because it was shown to be flexible, transparent, and relatively easy to understand for lay audiences.

The methodology is as follows: The latest available version of the US EPA's environmental justice screening tool, EJSCREEN 2017, was taken as our starting point. EJSCREEN 2017 compiles data from various government bodies on 11 environmental indicators[1] and 6 population indicators[2]. (More information about the data behind these indicators is provided by the US EPA here.) Values for each of those 17 indicators are provided for each census blockgroup in the country. The first step of our analysis entailed extracting the values our area of interest: in this case Chicago's 2,277 blockgroups. Next, for each of the 17 indicators, each blockgroup was assigned a quintile score from 1 to 5, corresponding to its value for that indicator. A score of 1 meant that the blockgroup's value for that indicator fell into the bottom 20th percent, as compared to all Chicago blockgroups; a score of 5 meant that the value for that indicator was in the top 20th percent.

For each blockgroup, we summed the quintile scores for the 11 environmental variables, which gave us a total that could range theoretically from 11 to 55 (if a blockgroup got all 1's or all 5's, respectively). Next, we compared the total for each blockgroup to the totals from all 2,277 Chicago blockgroups, and assigned a new quintile score to each blockgroup based on that comparison. In other words, if a blockgroup's total was in the bottom fifth relative to all Chicago blockgroups, it would get a score of 1 for its "environment quintile score."

We repeated the same process above for the population characteristics. For each blockgroup, we summed the quintile scores for the 6 population characteristics, which yielded a total that could be anywhere between 6 and 30. We then assigned a new quintile score, from 1 to 5, to each blockgroup based on how its total compared to the totals from the other Chicago blockgroups. This was the blockgroup's "population quintile score."

The last step consisted of simply adding each blockgroup's environment quintile score and population quintile score to get a final score, ranging from 2 to 10. For both population and environment indicators, higher values denote greater vulnerability or exposure. Thus, the higher the blockgroup's final score, the greater the cumulative burden. For example, a blockgroup that was in the highest quintile for both environmental and population factors would have a final score of 5 + 5 = 10.

Please direct questions about the methodology to ylam@nrdc.org.

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[1] The environmental variables are: air toxics cancer risk, air toxics respiratory hazard, ozone, diesel PM, PM 2.5, traffic, potential lead paint exposure, proximity to superfund sites, proximity to hazardous waste management facilities, proximity to facilities with potential chemical accidents, and toxic releases into waterways.
[2] These are the percentages of the population with the following characteristics: household income less than twice the poverty level, minority status, less than a high school education, linguistic isolation, under age 5, and over age 64.