Memorandum

To: Governor J.B Pritzker
From: Divyadarshan Punjabi
Subject: Higher Expenditure in tackling air pollution will reduce Illinois' crime rate.
Date: October 24, 2021

Executive Summary

A direct causal link between air pollution and crime rate exists. Reduction in particulate matter over the years (2001-2012) in Chicago has estimated to have reduced violent crimes by 2.9 percent. Hence, revising air pollution abatement costs by increasing Pigouvian taxes, clean energy investments and subsidies on choosing a cleaner energy alternative can lead to a decrease in criminal activity on an urban scale in Illinois.

Key Findings

There is a long history in criminology, sociology, and economics focused on the relationship.[1] A literature in psychology summarized by Anderson and Bushman (2002)[2] documents a link between physical discomfort and aggressive behavior.

A second documented pathway linking pollution and aggression is that air pollution may directly affect brain chemistry by lowering levels of serotonin. Serotonin is a neurotransmitter that acts as an inhibitor. Low levels of serotonin are associated with increased aggression and impulsivity in adults, children and animals.[3]

Thirdly, air pollutants can inflame of nerve tissues in humans, dogs, mice and rats. Rammal et al. (2008)[4] finds experimental evidence that oxidative stress and similar neuro-inflammation increases aggression in mice, specifically the frequency with which mice attack unfamaliar mice put into their space.

Finally, pollution may lead to other physiological changes that manifest in increased aggression.

Herrnstadt et at. (2020)[5] chose an urbanized city (Chicago) to study particulate matter emissions, crime rate and various felonies, and wind speed in different neighborhoods over a period. The data sets for the study were collected from National Climatic Data Center (NCDC) and Chicago Police Department's Citizen Law Enforcement Analysis and Reporting system. His findings estimated that a 'one-standard deviation' increase in PM10 emissions is associated with a 2.9% increase in violent crime. As a point of reference, the estimated effect of moving from the 77-86°F / 25-30°C maximum temperature bin to the 86-95°F / 30-3°C bin is a 7% increase in violent crime. Consistent with the medical literature on pollution and aggressivity, the effect seems to be specific to violent crime. Although we estimate that the effect of pollution on crime is modest in percentage terms, the annual aggregate costs of crime are enormous.

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[1] Anderson, Michael L, "As the Wind Blows: The Effects of Long-Term Exposure to Air Pollutionon Mortality," Technical Report 2019.

Archsmith, James, Anthony Heyes, and Soodeh Saberian, "Air quality and error quantity: Pollution and performance in a high-skilled, quality-focused occupation," Journal of the Association of Environmental and Resource Economists, 2018, 5 (4), 827–863.

Baron, Robert A and Paul A Bell, "Aggression and heat: The influence of ambient temperature, negative affect, and a cooling drink on physical aggression.," Journal of Personality andSocial Psychology, 1976, 33 (3), 245.

[2] Anderson, Craig A. and Brad J. Bushman, "Human Aggression," Annual Review of Psychology, 2002, 53, 27–51.

Estimates from the literature vary in magnitude but more conservative estimates suggest crime imposes external costs of several hundred billion dollars per year annually in the U.S., while the upper end of estimates Anderson (1999)[6] puts the aggregate cost of crime at over one trillion dollars annually. Herrnstadt (2020) further estimated the annual costs of crime associated with downwind interstate pollution specifically, in the entire United States, at $178 million per year. These estimates are of roughly similar magnitude to the cost of traffic congestion on pre-term births ($444 million per year) estimated by Currie and Walker (2011).[7]

Over the study period, 2001 to 2012, Herrnstadt (2020) noted that levels of pollutants reduced significantly. On base of roughly 46 thousand violent crimes in Chicago in 2001, 2 percent reduction violent crimes would correspond to 920 less violent crimes. With the assumption that these crimes were entirely the least costly violent crime (assaults), he estimated the crime reduction benefits for Chicago from pollution reduction over 2001 - 2012 estimated at $22 million per annum. The analysis thus, also suggests additional social cost of air pollution and that previous estimates of the marginal social cost may be understated.

Recommendation

I recommend Governor J.B Pritzker to increase Pigouvian taxes on local pollutants and to introduce subsidies on pollution abatement measures taken up citizens and local firms. An increase in clean energy investment – particularly in electric vehicles – would be effective since vehicular emissions are a major source of particulate matters.

Conclusion

Firstly, a Pigouvian tax or external cost estimate for local pollutants excluding the cost of crime are understated in many urban cities. Secondly, there is enough to evidence to show that pollution exposure might have adverse effect on cognition and behavior that extend more widely than previously considered. Therefore, revising pollution abatement costs will not only have environmental benefits, but a reduction in criminal activity also.

[3] Coccaro et al. (2011) summarizes the literature linking serotonin depletion and impluse control. Decreased serotonin is associated with an increased tendency to fight amongst rhesus monkeys (Faustman et al. (1993)), increased impulsive aggression in children (Frankle et al. (2005)) and decreased harm avoidance in adults (Hansenne et al. (1999)).

[4] Rammal, Hassan, Jaouad Bouayed, Chafique Younos, and Rachid Soulimani, "Evidence that oxidative stress is linked to anxiety-related behaviour in mice," Brain, Behavior, and Immunity, 2008, 22 (8), 1156–1159.

[5] Herrnstadt, Heyes, Muehlegger, Saberian, "Air Pollution and Criminal Activity: Microgeographic Evidence from Chicago," 2020.

[6] Anderson, David A, "The aggregate burden of crime*," The Journal of Law and Economics, 1999, 42 (2), 611–642.

[7] Currie, Janet and Reed Walker, "Traffic Congestion and Infant Health: Evidence from EZPass," American Economic Journal: Applied Economics, 2011, 3 (1), 65–90