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PERCSPECTIVES ON RESEARCH

THE EFFECT OF OPEN-AIR WASTE BURNING ON INFANT HEALTH: EVIDENCE FROM GOVERNMENT FAILURE IN LEBANON

An estimated 40 percent of global waste is burned in the open air and is a popular method of waste reduction, especially in developing nations. However, according to recent research, this practice is responsible for more than 20 percent of particulate matter and nearly 40 percent of Polycyclic Aromatic Hydrocarbons in the atmosphere worldwide.

Concern over this practice continues to mount as waste production is increasing at a rapid rate. The World Bank estimates that from 2012 to 2025, worldwide garbage will nearly double from 1.3 billion tons to 2.2 billion tons. Despite the prevalence of open-air waste burning and its role in reducing air quality, little is known about its health consequences, particularly for children. In working paper 2004, PERC's Rex B. Grey Professor Mark Hoekstra, along with coauthors Ruba Ajeeb and Pierre Mouganie, study the effects of in-utero exposure to open-air waste burning on the health of infants at birth.

Open-air waste burning, or the uncontrolled incineration of organic and inorganic waste in landfills and residential areas, is estimated to be responsible for only a small proportion of global emissions of carbon dioxide, methane, and carbon monoxide. However, it is responsible for high proportions of particulate matter, which are believed to affect risks of lung cancer, respiratory disease, heart failure and, notably, birth outcomes. Importantly, the pollutants generated by open-air waste burning are also believed to have impacts on infant health through in-utero exposure.

Prior to this work, the health outcomes of open-air waste burning have not been clearly studied. This is due to two factors: the data limitations in developing countries where the practice is common, and because it is difficult to credibly separate health outcomes caused by open-air waste burning from

other unrelated variables. The outcomes of adults who are exposed to waste burning are especially difficult to study, as effects may only show up years later.

In children, there is significant evidence that prenatal and early childhood environments are especially important for long-term adult health. Maternal exposure to the pollutants from waste burning can affect infant health by causing oxidative stress and DNA damage to cells, or by having direct effects on blood, blood pressure, or endothelial function, which can affect the transfer of nutrients to the fetus. As such, this is the first study of its kind to study how open-air waste burning affects infants prior to birth.

To do so, the authors study the consequences of waste burning that occurred as a result of the Lebanese garbage crisis of 2015. The crisis was caused by the unexpected closure of a major landfill in Lebanon during the summer of 2015, which led to massive pileups of garbage in residential neighborhoods across Lebanon, and to an abrupt, unanticipated increase in waste burning throughout the country.

The authors construct a new data set, sourced from the Lebanese Civil Defense Agency, that contains the dates and locations of all fires related

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to waste burning for 373 neighborhoods in two governorates in Lebanon from 2015 to 2016. This neighborhood residential data is then matched with detailed newborn medical information from the American University of Beirut Medical Center, the main medical center in Lebanon. Medical outcome information includes the date of birth, weight, height, head circumference, gestational age and gender of all babies born between May 2010 and February 2017 at the hospital.

Findings show that exposure to at least one incident of waste burning increased the likelihood of premature birth by roughly 4 percentage points, or 50 percent. Exposure increased the likelihood of low birth weight, which is defined as below 2,500 grams, by 5 to 8 percentage points, or 80 - 120 percent. Results also show that effects increase with more exposure. Each additional waste fire to which a

pregnant woman is exposed increases the probability of low birth weight by 0.6 to 1 percentage points, or approximately 10 percent, and overall birthweight by 9 to 18 grams. These effects are robust to a wide range of controls including baby gender, maternal age, type of insurance, district-by-year fixed effects, and neighborhood time trends.

When compared to related studies, these negative effects on birth outcomes are large. When combined with the previous consensus on the long-term negative impacts of low birth weight on future adult health, educational attainment, and wages, these results suggest that the overall consequences of open-air waste burning also have large economic impacts. However, it also suggests a straightforward channel for improving human health: proper waste collection and disposal that does not involve open-air burning.

MISDEMEANOR PROSECUTION

Each year, approximately 13 million Americans are charged with misdemeanor offenses and misdemeanor cases make up over 80 percent of the cases processed by the U.S. criminal justice system. In response, many communities are reconsidering the costs borne by the defendant and the criminal justice system, as well as the public safety benefits of prosecuting these low-level crimes. In working paper 2103, PERC Professor Jennifer Doleac, along with coauthors Amanda Agan and Anna Harvey, study the impact of choosing not to prosecute, or nonprosecution, of nonviolent misdemeanor charges.

A number of District Attorneys across the U.S. have begun to implement alternatives to criminal prosecution for those charged with misdemeanor crimes, particularly for nonviolent defendants. By doing so, the defendants avoid the potential negative consequences of criminal prosecution, including having a criminal record of arrest, time away from work and family, and a possible criminal record of conviction of a crime.

Although there is a body of literature focused

on decision makers in the criminal justice system, these studies primarily focus on the effects of the decisions of judges on incarceration. Currently, there is little evidence to guide District Attorneys' policy choices on the overall effects of nonprosecution of nonviolent misdemeanor charges.

Using data between 2004 and 2018 on the prosecution of criminal complaints from the Suffolk County District Attorney's Office in Massachusetts, this paper provides the first evidence of the effects of the decision to not prosecute misdemeanor defendants. In this data, the final charge dispositions and the dates of those dispositions are used. Each defendant in a case is then followed for a period of two years following the arraignment hearing. Cases with violent offenses or those with felony charges are excluded. Using a data set of over 65,000 complaints, this paper uses the as-if-random assignment of Assistant District Attorneys to study the effects of leniency of prosecution decisions on individuals who may have otherwise been prosecuted.

In Suffolk County, applications for misdemeanor criminal complaints are brought to the court within

“...prosecuting marginal nonviolent misdemeanor defendants substantially increases their subsequent criminal justice contact.”

the geographic jurisdiction where the alleged offense occurred. After an initial review, cases that have been determined to have probable cause to issue a criminal complaint are assigned an arraignment date and the individual named in the complaint is issued a notification to appear at the arraignment hearing where, typically, an Assistant District Attorney will act as the decision maker.

Arraignment hearings are scheduled to be heard in designated courtrooms by the court with jurisdiction over the case, without regard to which Assistant District Attorney is assigned to that courtroom. For cases that continue past the day of arraignment, a different Assistant District Attorney is assigned through a separate process. During the arraignment hearing, the defendant is officially charged, the criminal complaint is read into the record, and a plea is entered on the defendant's behalf. The arraigning Assistant District Attorney will choose to dispose of a complaint prior to or during the arraignment hearing, or to proceed with prosecution.

'Nonprosecution' is used to define all cases that end before or at the arraignment hearing without a conviction; prosecution includes all other outcomes. Nonprosecution thus includes occurrences that end in dismissal or decline to prosecute, where the charge is dismissed immediately, along with pretrial probation. Importantly, state statute stipulates that complaints disposed of prior to a defendant's formal arraignment do not become part of a defendant's criminal record, but complaints disposed of or after arraignment do become part of a defendant's criminal record, even if the complaint does not result in a conviction.

The authors first estimate the impacts of misdemeanor nonprosecution on future criminal

complaints. Findings show that the marginal nonprosecuted misdemeanor defendant is 33 percentage points less likely to be issued a new criminal complaint within the next two years. Nonprosecution reduces the likelihood of a new misdemeanor complaint by 24 percentage points and 8 percentage points for a new felony complaint. Nonprosecution also reduces the number of future criminal complaints by 2.1 complaints, future misdemeanor complaints by 1.2 complaints, and felony complaints by 0.7 complaints. Adding controls for demographics of the defendant, such as gender, age and ethnicity produced similar results.

To test whether misdemeanor prosecution pulls defendants into the criminal justice system who would otherwise remain outside the system, the authors separate first-time defendants from those who appear in the data set for more than one complaint. Results show that estimates are indeed larger for first-time defendants than for those with previous complaints.

Lastly, the authors discuss the possible reasons why nonprosecuted defendants are less likely to reenter the criminal justice system. By definition, cases that are not prosecuted are closed on the day of arraignment. In contrast, the average time to disposition for prosecuted nonviolent misdemeanor cases in the sample was 185 days. Criminal records of misdemeanor convictions may lower a defendant's job prospects and increase the likelihood of future prosecution and acquisition of a criminal record. Findings show that nonprosecution reduces the likelihood that a defendant will receive a criminal record of that nonviolent misdemeanor complaint by 55 percentage points. These records are visible to law enforcement agencies as well as to potential employers.

Altogether, these findings show that if all arraigning Assistant District Attorneys acted more in line with the most lenient in the sample when deciding which cases to prosecute, Suffolk County would likely see a reduction in criminal justice involvement for these nonviolent misdemeanor defendants. In addition, an analysis of the effects of a Suffolk County policy change that establishes a presumption of nonprosecution for a list of nonviolent misdemeanor charges finds that this change reduces the likelihood of future criminal complaints within one year of arraignment without an increase in reported crimes.



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