Endangering Generations

How the Trump Administration's Assault on Science Is Harming Children's Health

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Appendix: Methodology

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This appendix is designed to provide a more detailed version of the methodology used to carry out analyses on Chlorpyrifos, PFAS, Product Recalls and Air Pollution in the *Endangering Generations* report.

Chlorpyrifos Analysis

To estimate the number of children living in areas where chlorpyrifos is likely used, we first determined which regions of the country are potentially contaminated with chlorpyrifos. We used geographic data from the US Geological Survey that records land use for the entire United States as well as chlorpyrifos use by county from 2016. We first identified farmland and then identified the farmland on which chlorpyrifos is likely used, allowing us to create a geographic data layer of farmland likely contaminated with chlorpyrifos.

Second, we determined the number of children living in these chlorpyrifos-contaminated areas. We retrieved Census Bureau data of the number of children under the age of five living in each census block. Since census blocks do not align perfectly within the agricultural areas we identified, we calculated the percentage of agricultural land in each census block and used this percentage to estimate the number of children living in areas potentially exposed to chlorpyrifos. For example, if chlorpyrifos-contaminated cropland made up 70 percent of a census block in which 10 children lived, then we estimated that seven of those children are living in chlorpyrifos-contaminated areas. By adding together these census block estimates, we estimated the total number of children likely living in areas contaminated with chlorpyrifos.

PFAS Analysis

A series of geographic buffers were used to identify the number and estimated enrollment of schools (public and private) as well as the number and enrollment of childcare facilities near facilities contaminated with Per- and Polyfluoroalkyl substances (PFAS). Our results underestimate the number of facilities near PFAS contamination sites because the childcare facility dataset used does not include group home and family-based child daycares. A series of geographic buffers were used to identify the estimated number of women of reproductive age living near PFAS contaminated sites. For this analysis we used data from the US Census Bureau to determine the number of women 15-49 years of age at the census block group level.

To determine the number of schools and childcare facilities near to PFAS-contaminated sites, a spatial analysis was performed in geographic information (GIS) software. Data on the locations and enrollment of both public and private schools as well as childcare facilities in the United States were acquired from the Homeland Infrastructure Foundation Level Data Database (HIFLD 2017). The locations of PFAS-contaminated facilities were obtained from the Northeastern Social Science Environmental Research Institute and loaded into ArcGIS Pro along with the locations of schools and childcare facilities (SSEHRI 2018). Radii of one, three, and five miles were drawn around each PFAS facility. Schools and childcare facilities were selected based on their location near PFAS-contaminated facilities.

After recording the number of educational facilities near PFAS-contaminated sites, the same data were used as described above with the addition of population data for each census block group in the United States. Data were retrieved from the 2017 US Census Bureau American Community Survey through the National Historical GIS database (NHGIS 2019). Using these census data, we calculated the number of women of reproductive age (15 to 49 years of age) living in each census block group. We then calculated a weighted sum of women living within each radius around the PFAS-contaminated sites. For example, if a census block

group around a facility had 100 women of reproductive age, but only 50 percent of the block group fell within a three-mile radius of a PFAS-contaminated site, we estimated that 50 women from that census block lived within three miles of the facility. This calculation was performed for each facility, and the estimates were summed to provide an overall estimate of the number of women of reproductive age living near PFAS-contaminated facilities.

Product Recalls Analysis

To create graphs of the number of recalls related to children's products, the Consumer Safety and Protection database was queried for various products using a python script. The resulting table was then imported into R/RStudio, and histograms were created to show the frequency of recalls associated with each year.

Children products included:

- baby clothes
- baby harness
- baby jumper
- baby mattress
- baby mattress pad
- baby monitor
- baby shoes
- baby swing
- baby walker
- bassinet
- car seat
- chalk
- child safety latch
- child safety lock
- cradle
- crayon
- crib
- crib bumper
- crib gym
- crib mobile
- crib tent
- highchair
- infant play center
- night light
- pacifier ring
- play yard
- portable baby swing
- portable crib
- potty chair
- potty training seat
- sleep positioner
- stroller
- stroller accessories
- teething ring
- toddler play center

Air Pollution Analysis

The air pollution analysis examined the counterfactual of what the impacts would have been of air pollution policies that were implemented, finalized, or in the process of finalization before the Trump administration took action to dismantle or weaken them. We asked the following question: if these air pollution policies were allowed to exist in their original forms and were allowed to be fully implemented and enforced, what would be the health benefits to children across the United States? To answer it, we studied regulatory impact analyses (RIA) conducted by the EPA prior to the advent of the Trump administration.

Below is a fuller description of what the individual RIAs showed in terms of health impacts and any potential data caveats or notes on methodology that should be considered when looking at the rule's impact. In particular, because some of these health benefits were calculated in earlier eras, the business-as-usual emission rates for industries are likely to have been different from those of today. Therefore, the health benefits listed in this analysis should be considered estimates of the degree of impact that these rules have on children's health and not as an exact representation of the counterfactual scenarios. Five different child health benefits of these rules were examined: asthma exacerbations (also called asthma attacks), upper and lower respiratory symptoms, acute bronchitis symptoms, and school absence days. Note that upper respiratory symptoms (which includes runny/stuffy nose, wet cough, and burning/aching/red eyes) and lower respiratory symptoms (which includes coughing, chest pains, phlegm, and wheezing) were combined in the final table, but several RIAs have analyzed these symptoms separately, and these numbers are recorded below.

MERCURY AND AIR TOXICS STANDARDS (OAQPS 2011)

This rule was designed to regulate mercury emissions from power plants, and the main attack from the Trump administration comes from its attempts to undermine a rule that has been already implemented. As a result, the rule is likely in danger of lapsed enforcement of the technology designed to reduce mercury in the air, which in turn would decrease the health benefits that this rule provides for children. The 2011 RIA showed that the rule would also prevent the following health harms every year: 130,000 asthma exacerbations in asthmatic children aged six to 18; 80,000 lower respiratory symptoms in children aged seven to 14; 60,000 upper respiratory symptoms in asthmatic children aged nine to 18; and 6,300 acute bronchitis symptoms in children aged eight to 12.

NATIONAL AMBIENT AIR QUALITY STANDARDS FOR GROUND-LEVEL OZONE (OAQPS 2015B)

The 2015 RIA showed that strengthening the ozone standard from 75 to 70 parts per billion, which was planned to be fully implemented by 2025, would prevent the following health issues in children every year: 230,000 asthma exacerbations in children aged six to 18 nationwide (except for California, where it was 160,000); 11,000 upper and lower respiratory symptoms in children aged seven to 14 nationwide (2,000 in California); and 160,000 school days lost in children aged five to 17 nationwide (120,000 in California).

CLEAN POWER PLAN (OAQPS 2015A)

This rule governed the regulation of greenhouse gas emissions from power plants and was repealed by the Trump administration and replaced with the Affordable Care Act. The Clean Power Plan set out to achieve stronger regulation of power plant emissions, including the enforcement of these standards in states where power plants may be lagging in their climate

commitments. The Affordable Care Act will not provide this type of regulation, and power plants will therefore be able to emit or not emit in a business-as-usual scenario. The 2015 RIA examined two plans when estimating health benefits, the Rate-based Illustrative Plan and Mass-based Illustrative Plan, and the ranges of health benefits shown in our results represent the two different implementation approaches. The RIA showed that when the Clean Power Plan was fully implemented in 2030, in every subsequent year the following health symptoms in children would be prevented: 1,600 to 2,000 acute bronchitis symptoms in children aged eight to 12; 130,000 to 140,000 school absence days for children aged five to 17; 21,000 to 26,000 lower respiratory symptoms in children aged seven to 14; 30,000 to 37,000 upper respiratory symptoms in children aged nine to 11; and 74,000 to 90,000 asthma exacerbations in children aged six to 18.

NITROGEN OXIDES STATE IMPLEMENTATION PLAN (OAR 1998)

This rule limited the emission of nitrogen dioxides from industrial facilities in the District of Columbia and the following 20 states: Alabama, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin. The Trump administration allowed this rule to be weakened such that the most stringent method of monitoring air pollution will no longer be mandatory, thereby jeopardizing the health benefits that this rule can provide for children. For the 1998 RIA, the ranges in the health estimates reflect the highs and lows of a variety of different scientific modeling and regulatory techniques. According to the RIA, the rule following health symptoms in children would be prevented: 343 to 1,683 fewer upper respiratory symptoms in asthmatic children aged nine to 11; 2,567 to 18,675 fewer lower respiratory symptoms in children aged eight to 12; and 257 to 2,171 fewer acute bronchitis symptoms in children aged 10 to 12.

PASSENGER VEHICLE FUEL ECONOMY AND EMISSIONS STANDARDS (OTAQ 2012)

This rule regulated the greenhouse gas emissions and fuel economy standards of light-duty vehicles for the years 2017 to 2025. The 2012 RIA estimated that, when the rule was fully implemented in 2030, the following annual health symptoms would be prevented: 3,500 asthma exacerbations in asthmatic children aged six to 18; 160 acute bronchitis symptoms in children aged eight to 12; 2,100 lower respiratory symptoms in children aged eight to 12; and 1,600 upper respiratory symptoms in children aged nine to 18. While the administration has proposed rolling back standards for part of this time period (2021–2025), more recent analysis indicates that the EPA likely underestimated the original benefits of its standards, showing that there is an even greater weight of evidence suggests that harms are likely to result when rolling back this regulation (Henderson et al. 2018).

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