Public Disclosure of Real-time Pollution Data in China: Impacts on Individual Behavior and Health

Panle Jia Barwick, Shanjun Li, Liguo Lin, and Eric Zou (2023). **From Fog to Smog: the Value of Pollution Information.** National Bureau of Economic Research (NBER) working paper.

Despite hazardous pollution levels in the 2000s, China did not have a systematic air quality monitoring system, and dissemination of limited official data was highly controlled or forbidden. In response to public outcry over the lack of transparency, China launched a real-time air quality monitoring program in 2013. The program published pollution data from sensors in 337 cities across the country that covered 98% of the country's pollution. How did the sudden and widespread availability of pollution information affect household behavior and individual health in China?

The data. Researchers sought to measure changes in public awareness of pollution, pollution avoidance behavior, and mortality before and after the rollout of the program. To do so, they first gathered data on pollution levels published through China's official monitoring program coupled with data from satellites operated by NASA. Then, to measure public awareness of pollution, they analyzed trends in pollution-related words in the *People's Daily*, a leading government newspaper, release of pollution-related mobile applications from Apple's App Store, and internet searches using pollution-related words from Baidu, China's most widely used search engine. Researchers also measured public attitudes toward pollution using the China Family Panel Studies (CFPS), a nationally representative longitudinal survey. The CFPS was used to compute additional local outcomes.

INSIGHTS

- The launch of a nationwide pollution monitoring program in China in 2013 caused a sharp rise in public access to information and social awareness of pollution, demonstrated by pollution-related coverage in official media, internet searches, and app releases.
- After the program was implemented, higher levels of pollution were associated with reduced outdoor activities, and air purifier purchases more than doubled from 11,000 to 25,000 units per month.
- The program led to an estimated 114,000 fewer pollution-related deaths per year among people aged 60 and above, and savings of nearly $15 billion annually in mortality and morbidity costs.

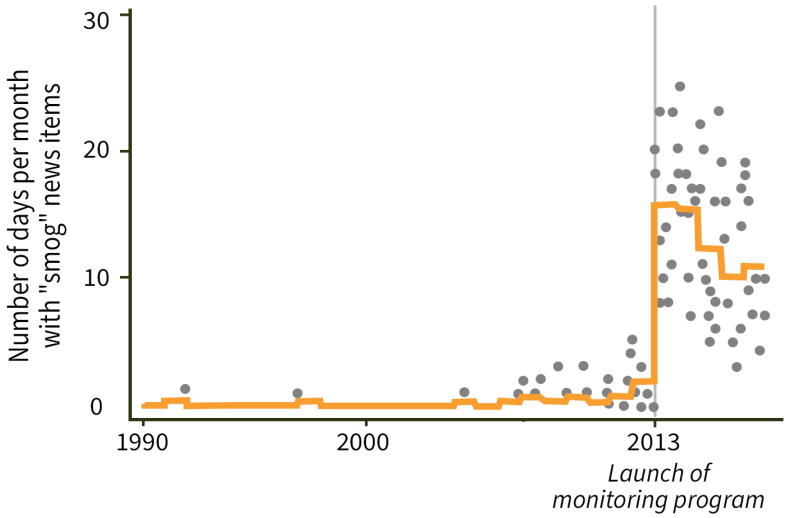
To assess changes in pollution avoidance behavior, researchers tracked shopping trips using data from all credit and debit card transactions at physical stores between 2011 and 2016 from Union Pay, China's only inter-bank payment clearinghouse, and gathered air purifier sales data from Growth from Knowledge, a market research firm.

To determine the impact of behavior changes on mortality, researchers analyzed changes in mortality rates derived from a representative sample of China's population collected by the Chinese Center for Disease Control and Prevention's Disease Surveillance Points system.

Better access to pollution information intensifies public concern. Researchers found that the monitoring program sharply improved public access to pollution information and dramatically increased households' awareness of pollution issues. After the program's launch in 2013, the frequency of pollution keywords like "smog" appearing in the *People's Daily*, a leading official newspaper, jumped from 2 to 16 days per month.

In addition, the number of pollution-related applications available for download on the Apple App Store surged: 82% were released between 2013 and 2015, compared to the 18% released between 2009 and 2013. National surveys also showed a rise in respondents' concern for environmental issues after the program launch, driven primarily by people living in cities with high levels of air pollution.

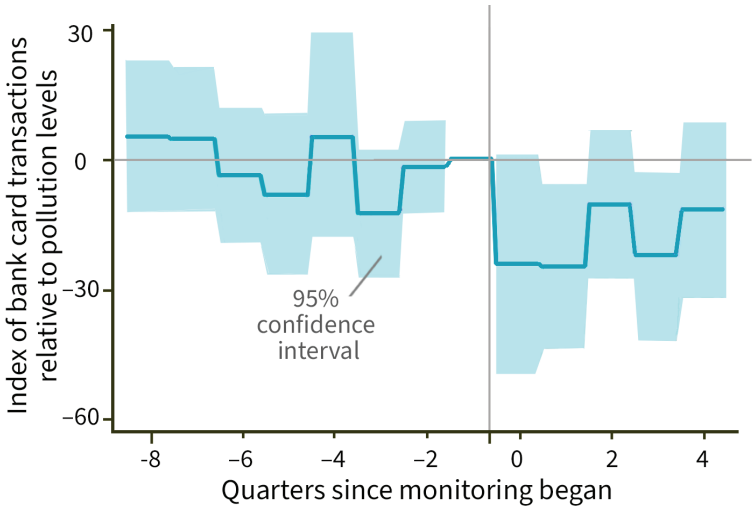
News mentioning "smog" in the Peoples Daily *newspaper since launch of the monitoring program*



Public awareness of pollution levels triggers behavioral changes. Following the introduction of the monitoring system, people made fewer shopping trips during periods of higher pollution: a doubling of pollution levels caused a 1.4 percentage point decrease in bank card transactions from the mean transaction frequency. For outdoor activities that were easily deferrable, such as supermarket visits, restaurant dining, or amusement park visits, the decline was sharper, at between 2.6 and 5.5 percentage points. The monitoring program also significantly intensified defensive spending: purchases of air purifiers more than doubled — rising from 11,000 units per month in 2012 to more than 25,000 units per month after 2013 — and their purchase became highly correlated with local air pollution levels.

Awareness of pollution reduces mortality. After pollution information became widely available, researchers found that individual behaviors changed to mitigate the effects of pollution. The end result was a drop in mortality. More specifically, after implementation of the program, a doubling in city pollution levels in a given week was associated with 1.2–2.3% fewer deaths. Eighty percent of this reduction in mortality came from declines in cardiovascular and respiratory illnesses that are commonly linked to pollution exposure. This decline in mortality amounted to approximately 114,000 fewer deaths per year for those aged 60 and above. The analysis also showed that residents of wealthier cities were better able to limit their pollution exposure.

Effects of pollution intensity on bank card transactions since launch of the monitoring program



Publicizing pollution data achieves major health gains at low cost. Evidence from the pollution monitoring program suggests that China's decision to provide real-time pollution data combined with dissemination infrastructure such as smartphones and the Internet served as a powerful tool to help households mitigate the health damages caused by environmental pollution. Researchers' cost-benefit analysis found that the savings from reduced mortality and morbidity amounted to at least $14.9 billion per year. Costs of the program, including increased defensive spending, foregone consumption, and the costs of the monitoring program itself amounted to $1.4 billion annually. Taken together, the study suggests that empowering the public with real-time pollution information mobilizes individuals' ability to mitigate the adverse consequences of pollution at a relatively low cost.