Putting administrative data to work for public health: The case of health screening

By Ludovica Gazze

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Effective health care delivery often requires timely screening to detect issues at early stages, when consequences can be more easily mitigated. The importance of screening has become especially apparent in the current COVID-19 pandemic, with policy discussions focusing on the screening of both symptomatic and asymptomatic individuals. However, individual motives to seek or refuse screening may not align with public health guidelines. For example, when test supply shortages are a concern, it may be best to target resources to high-risk individuals. Yet, some low-risk people may insist on getting tested, perhaps because they have read about the gravity of the pandemic in the media. Conversely, some high-risk individuals may avoid getting tested if they feel that they could not access life-saving treatment, or could not afford the prescribed quarantine following a positive test result, or simply if they cannot take time off work to get to a screening location. To design effective screening policies and improve public health it is crucial to understand what determines an individual's decision to seek screening (Einav et al., forthcoming).

My research examines one potential barrier to screening — travel costs – in the context of screening for lead poisoning in the United States. Do travel costs deter people from accessing screening or do they help target screening resources to the highest risk children? The answer to these questions can help policymakers make important choices about the location and targeting of health screening provision.

Barriers to screening: The case of lead poisoning in Illinois, the United States

Lead exposure has extremely severe consequences for children's cognitive and non-cognitive abilities and it imposes large costs on society. Nonetheless, sources of lead exposure are still pervasive in the United States: two-thirds of the Illinois housing stock, almost 3.6 million homes, was built prior to the residential lead paint ban in 1978 and may have lead paint. As children start moving autonomously around the house, usually between 9 and 24 months of age, they may ingest or inhale lead dust from deteriorating paint. However, getting the lead out of every home indiscriminately is very costly. Current programmes rely on children's visits to the doctor at ages 1 and 2 to identify 'poisonous' homes. This system potentially introduces a barrier if some families have difficulties in getting to the doctor's office at the right ages. And perhaps because of this barrier, over a third of high-risk children in Illinois, who are required by the state to be screened, do not receive testing.

Are families deterred from screening due to travel costs to the doctor? To answer this question, I assemble a large set of address-level administrative data detailing children's screening outcomes, travel costs, and lead exposure risk. First, I link almost 2 million birth records of all children born in Illinois between 2001 and 2014 to 2.9 million blood lead test records to construct children's screening histories. Second, I map children's addresses at birth and lead-screening providers' addresses to measure the distance a child must travel to get screening. Third, I link these individual-level data to address-level housing age to construct a measure of exposure risk at birth addresses, as housing age is a good predictor of both lead paint use and lead content in paint.

Travel costs decrease lead screening for both high-risk and low-risk children

Because health care providers open and close for reasons largely unrelated to lead screening policies, I can compare screening outcomes for children born in the same neighbourhood, or even at the same address, but in different years. These children face different travel costs, as some providers may have opened or closed in the meantime. Figure 1 shows that children who live closer to providers are more likely to be screened: a difference of 10 kilometres, approximately a 15-minute round trip by car, decreases screening by 9% relative to the mean screening rate of 46%.

But who are the children that forego screening at higher distances? Consider two children, one in an old house and one in an adjacent new house. There is a clinic 250 metres away, and both get screened. Years later, two new children move in; the clinic is closed, and the closest provider is now a kilometre away. Knowing that the new house is lead-free, only the parents in the old house take their child to get screened. Among the screened children in this example, the probability that a child lives in an old home increases with distance: it is 0.5 at 250 metres and 1 at one kilometre. This would suggest that travel costs help target screening resources to the highest risk children. My findings, as shown in Figure 2, do not support this hypothesis. Children who attend

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screening from farther distances do not have higher risk: if anything, they have lower blood lead levels.

What are the lessons for public policy?

So, travel costs do not improve targeting, and in fact decrease timely detection of lead poisoning. Can different policies do better? Figure 3 shows that travel subsidies, pay-for-performance incentives and targeted screening mandates can all increase detection.

Currently, only children living in zip codes defined as high-risk for lead poisoning are required to be screened. Based on this research, the state of Illinois decided to pause the extension of universal screening to the whole state to focus resources on removing the barriers still preventing these high-risk children from being screened. For example, in follow-up work we are using machine learning techniques to identify under-screened high-risk clusters, demonstrating the potential for coupling granular administrative data with frontier methods to improve public policy design.

The findings of this research, and the methods used, could provide significant lessons for the screening of COVID-19. As the UK strives to keep schools and workplaces open for the long term, understanding what motivates or hinders people to seek testing could be crucial to identifying and containing outbreaks of the virus. ◀

About the author

Ludovica Gazze is Assistant Professor of Economics at the University of Warwick and a CAGE Deputy Theme Leader.

Further reading

Einav, L., Finkelstein, A., Oostrom, T., Ostriker, A. J. & Williams, H. L. (forthcoming). Screening and Selection: The case of Mammograms. *American Economic Review*.

Gazze, L. (2020). Hassles and Environmental Health Screenings: Evidence from Lead Tests in Illinois. *CAGE working papers* (no. 509).

Figure 1: Children who live closer to screening providers are more likely to be screened

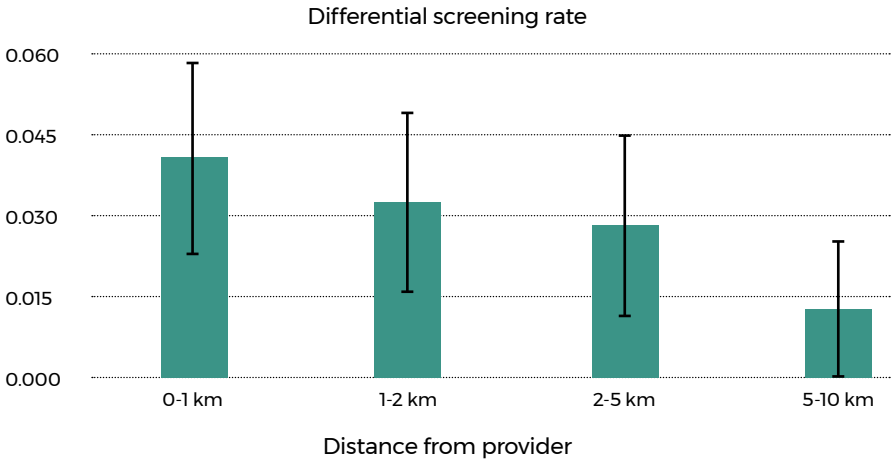

Figure 2: Children who attend screening from further distances do not have higher risk

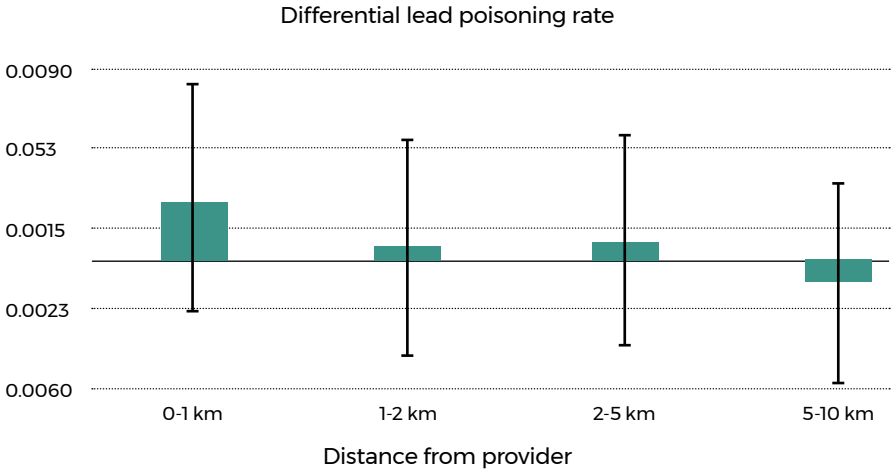

Figure 3: Travel subsidies, pay-for-performance incentives and targeted screening mandates can all increase lead poisoning detection