The Pollution–Productivity Curve: Non-linear Effects and Adaptation in High-pollution Environments

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Research question

What is the marginal effect of PM2.5 exposure on labor productivity?

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Why does this matter?

- Over one-third of the global population is exposed to hazardous annual average PM2.5 levels ($> 35 \mu g/m^3$) (Rentschler and Leonova, 2023).
- Does a marginal increase in PM2.5 affect these people differently than people who are used to cleaner air?
  1. Non-linearities
  2. Adaptation

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What does this paper add?

- Demonstrates that workers build tolerance to particulate matter air pollution.

Performance data

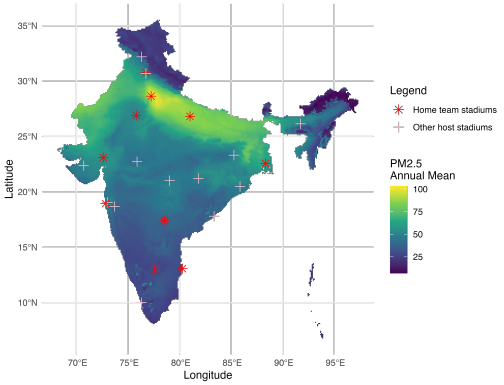
Figure 1: Outcome: run-scoring

Source: Wikipedia.

- Granular data on performance: 183,572 deliveries (throws)
- 619 individuals
- 14 years (2008-2022)
- 773 matches
- 20 stadiums

Air pollution data

Figure 2: PM2.5 in Cricket Stadiums

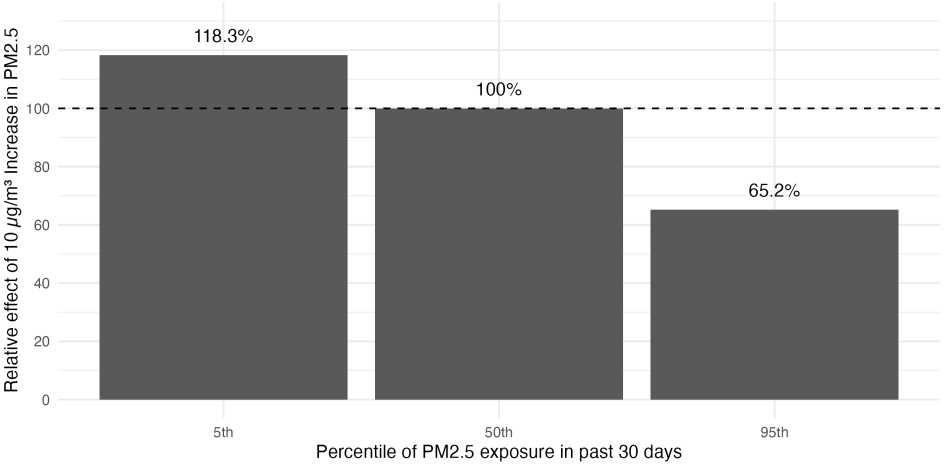


Notes. Annual mean PM2.5 in 2019.

- Rich air pollution data (daily PM2.5, 10km^2 gridded)
- Quasi-experimental variation in
  1. contemporaneous PM2.5 exposure
  2. past PM2.5 exposure
- **Key questions**
  - What types of data products are appropriate for PM2.5?
  - What is the right time window for past exposure?
  - How to attach a long-run measure to a person, not a place?

Main result: PM is less damaging for those used to it

Figure 3: Effect of 10 μg/m³ Increase in PM2.5 on Run-Scoring



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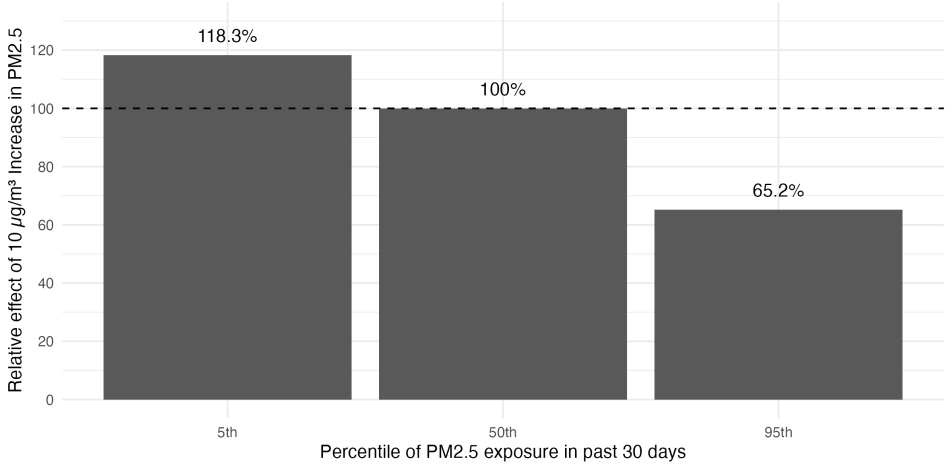

Thanks! msbrooks@ucdavis.edu
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Rentschler, J. and N. Leonova (2023): "Global air pollution exposure and poverty," *Nature Communications*, 14, 4432, publisher: Nature Publishing Group.

Figure 4: Dose-response of Productivity to PM2.5