The Benefits of Uniform Compliance with National Air Quality Standards

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Resources for the Future
VALUABLES Consortium

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Motivation

1. 37% of U.S. lives in county with no PM$_{2.5}$ monitor.
2. Monitor sample may not be representative of population.

⇒ Use satellite data (Dalhousie) to fill the gaps.

We then calculate the potential benefits of more uniform compliance with CAA.
Not many areas are non-attainment

PM$_{2.5}$ Non-attainment, annual standard, 2015
Satellites show many areas close to NAAQS cutoff

PM$_{2.5}$ Design Values, 2015
Monitors miss lots of pollution

PM$_{2.5}$ Design Values and Attainment Status, 2015
Indianapolis, IN

PM$_{2.5}$ Design Values and Attainment Status, 2015
Mis-classified areas, annual standard, 2015

Non-attainment
Misclassified as attainment
County with misclassified area
Regulators are very good at targeting monitors over NAAQS

PM$_{2.5}$ averages at monitors

![Graph showing PM$_{2.5}$ averages from 2009 to 2017 with data points for non-attainment over NAAQS, non-attainment under NAAQS, and attainment. The graph shows a decrease in PM$_{2.5}$ levels over the years with a significant drop after 2015.](image)
What if all areas over NAAQS were targeted like monitors?

- Monitors over NAAQS see \( \sim 2 \mu g/m^3 \) PM\(_{2.5}\) reduction after non-attainment classification.
- If mis-classified areas were treated similarly
  - 3,321 fewer deaths (DR from Lepeule et al. 2012)
  - $30 billion VSL annually for 2–5 years.

- What about non-attainment areas away from monitor?
Change in concentration for people over NAAQS
Monitors vs. satellites

<table>
<thead>
<tr>
<th>Year</th>
<th>Monitor</th>
<th>Satellite</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>1.50</td>
<td>0.25</td>
</tr>
<tr>
<td>2014</td>
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<tr>
<td>2015</td>
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<td>2016</td>
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<tr>
<td>2017</td>
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<td>-0.50</td>
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<tr>
<td>2018</td>
<td>0.25</td>
<td>-0.75</td>
</tr>
</tbody>
</table>

Change in PM$_{2.5}$ lagged 3-year average (µg/m$^3$)

(Sullivan & Krupnick (2018) 10 / 11)
Conclusion

- Millions of people likely mis-classified as “attainment”.
- Mortality costs at least $30 billion.
- Suggests large potential role for satellite data in regulatory analyses.

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VALUABLES convening session at 2018 AGU Fall Meeting:

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