

# Lay Perceptions of How Long Air Pollution and Carbon Dioxide Remain in the Atmosphere



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## ABSTRACT

The atmospheric residence time of carbon dioxide is hundreds of years, many orders of magnitude longer than that of common air pollution, which is typically hours to a few days. However, randomly selected respondents in a mail survey in Allegheny County, PA (N = 119) and in a national survey conducted with MTurk (N = 1,013) judged the two to be identical (in decades), considerably overestimating the residence time of air pollution and drastically underestimating that of carbon dioxide. Moreover, while many respondents believe that action is needed today to avoid climate change (regardless of cause), roughly a quarter hold the view that if climate change is real and serious, we will be able to stop it in the future when it happens, just as we did with common air pollution. In addition to assessing respondents' understanding of how long carbon dioxide and common air pollution stay in the atmosphere, we also explore the extent to which people correctly identify causes of climate change and how their beliefs affect support for action. With climate change at the forefront of politics and mainstream media, informing discussions of policy is increasingly important. Confusion about the causes and consequences of climate change, and especially about carbon dioxide's long atmospheric residence time, could have profound implications for sustained support of policies to achieve reductions in carbon dioxide emissions and other greenhouse gases.

## INTRODUCTION

Experts in the geophysics community have understood the role of greenhouse gasses in shaping the earth's climate for over a century. Despite scientific consensus on the need to dramatically reduce greenhouse gas emissions now, political discourse and media coverage have grown ever more confusing and contentious.

We report research designed to explore the extent to which Americans understand the fundamental difference in atmospheric residence time between common air pollutants and carbon dioxide. We also explore the possible consequences of this understanding by examining beliefs about causes of climate change and how these views influence willingness to take action against climate change. We ask:

1. To what extent do people understand the difference in atmospheric residence times between common air pollution and carbon dioxide, as well as the sources of each?

2. To what extent do people correctly identify causes of climate change?

3. To what extent do these beliefs affect people's support to take action against future serious changes in the climate?

## METHOD

### PA Mail Survey

- 400 addresses randomly sampled from zip codes across Greater Pittsburgh Area
- \$2.00 incentive
- 119 returned (30%).

### Online Survey

- National sample with Mechanical Turk (MTurk)
- \$1.25 incentive
- 1,013 responses
- 2 common questions with PA mail survey

## RESULTS

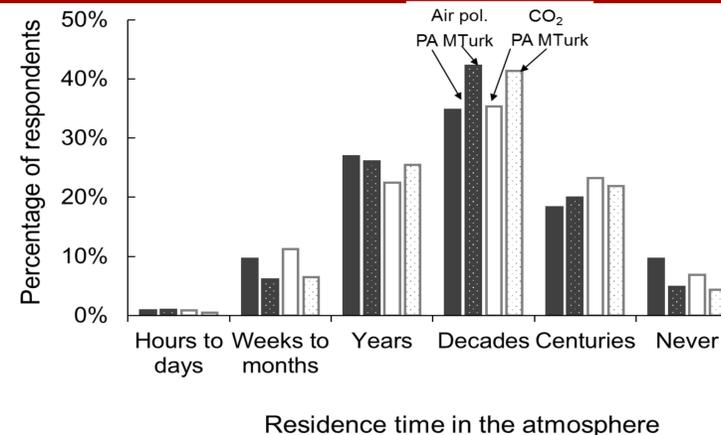
Results are for PA mail survey except where noted otherwise.

Table 1. Summary statistics for Pennsylvania and MTurk study sample, Allegheny County and the United States.

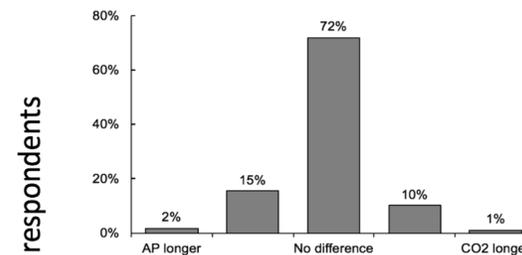
	PA Mail Sample	Allegheny County	MTurk Sample	U.S.
Female	55%	52%	49%	51%
Mean age	56*	41	36.6	36.8
Education	96% finished high school 44% completed college 21% completed graduate training	94% 38%	-	88% finished high school 59% some college 33% completed college 12% completed graduate training
Political affiliation	55% D 28% R 17% I	60% D 27% R 13% I	46% D 19% R 35% I	47% D 41% R 12% I

\* sample mean age is statically higher than Allegheny County's mean age

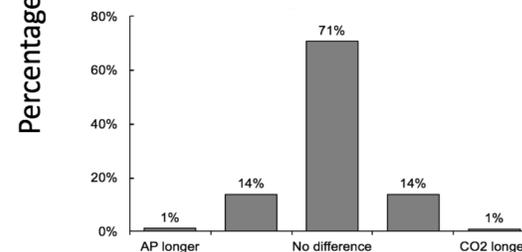
To what extent do people understand the difference in atmospheric residence times between common air pollution and carbon dioxide, as well as the sources of each?



Allegheny County PA mail sample:

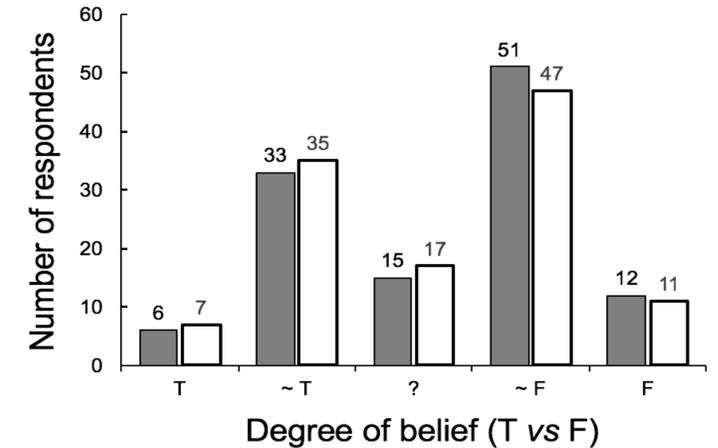


M-Turk national sample:



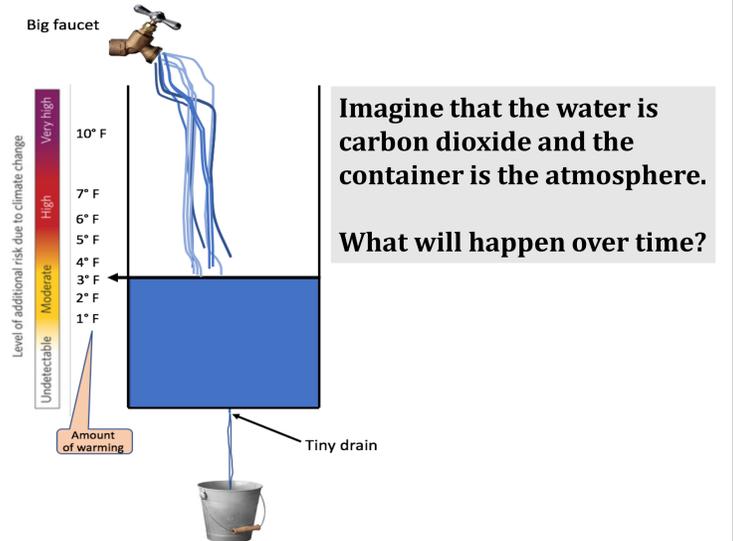
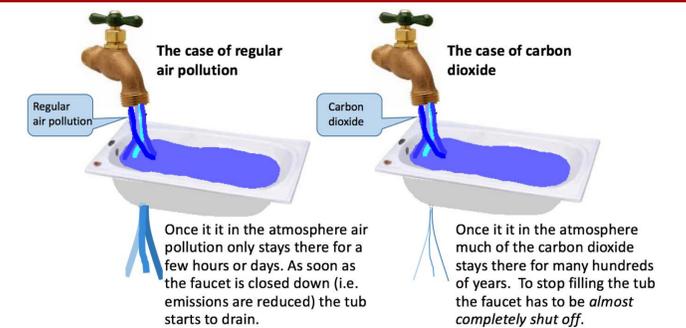
Difference between responses

Less than a few percent of the carbon dioxide that is in the atmosphere here in the United States has come from places that are thousands of miles away.



## NEXT STEPS

Communication and animation of different atmospheric residence times



## ACKNOWLEDGMENTS

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