Intra-city variability of fine particulate matter during COVID-19: A case study of Park City, Utah

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Abstract:
Urban air quality is a growing concern because due to a range of social, economic and health impacts. Since the SARS-CoV-19 pandemic began in 2020, governments have produced a range of non-medical interventions (NMIs) (e.g. lockdowns, stay-at-home orders, mask mandates) to prevent the spread of COVID-19. A co-benefit of NMI implementation has been the measurable improvement in air quality in cities around the world. Using the lockdown policy of the COVID-19 pandemic as a natural experiment, we traced the changing emissions patterns produced under the pandemic in a mid-sized, high-altitude city to isolate the effects of human behavior on air pollution patterns. We tracked pollution over time periods reflecting the Pre-Lockdown, Lockdown, and Reopening stages, using high quality, research grade sensors in both commercial and residential areas to better understand how each setting may be uniquely impacted by pollution downturn events.

Based on this approach, we found the commercial area of the city showed a greater decrease of air pollution than residential areas during the lockdown period, but both areas experienced a similar rebound post lockdown. The easing period following the lockdown did not lead to an immediate rebound in human activity and the pollution increase, associated with reopening, took place nearly two months after the lockdown period ended. Thus, we found patterns of change in human behavior and a corresponding change in the spatial distribution of pollutants that resulted in an effort to isolate the direct effects of human behavior on air pollution patterns. These findings show how energy policy may be impacted by the ongoing changes caused by the global pandemic. This research has implications for climate policy, low-carbon energy transitions, and may even impact local policy due to changing patterns in human exposure that could lead to important public health outcomes, if left unaddressed.