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Big Cities: Air Pollution and Human Health

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Background

The importance of clean air to the health of both individuals and communities is indisputable. PM2.5, one form of air pollution that accounts for the most health-related effects of air pollution in the United States, can be inhaled deeply into lung tissue, causing serious health complications[1]. Current literature has established strong connections to heightened air pollution and less physical inactivity, lowered life expectancy, higher morbidity and mortality, and increased hospital admissions. More specifically, air pollution has been connected to an increased risk for cardiovascular disease, diabetes mellitus, obesity, and system-wide immune, reproductive, and neurological damage[1]. Such threats to human health, especially to marginalized communities, need to be addressed.

Methods

We selected the 2021 County Health Rankings data set to use for our project. We selected the two most populous counties in each state, as highlighted in Figure 1, for our analysis.

Figure 1: Map of included counties.

We calculated correlation coefficients and performed linear regression analysis to examine the relationships amongst air pollution and sixty six other environmental and socioeconomic variables.
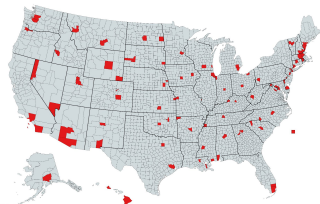
Results

	poor or fair health	low birthweight	children in poverty	income inequality	food insecurity
air pollution	0.456	0.413	0.476	0.448	0.398
	1.9E-06**	2.0E-05**	5.8E-07**	2.9E-06**	4.1e-05**

Table 1: Correlation coefficients between air pollution and relevant variables. p-values are listed under each coefficient.

	children in poverty	poor or fair health	child in poverty & poor or fair health	food insecurity & poor or fair health
air pollution	0.218	0.2	0.706	0.598
	5.75E-07**	1.9E-06**	2.2E-16**	2.2E-16**

Table 2: R^2 values produced as a result of linear regression analysis. p-values are listed under each value.
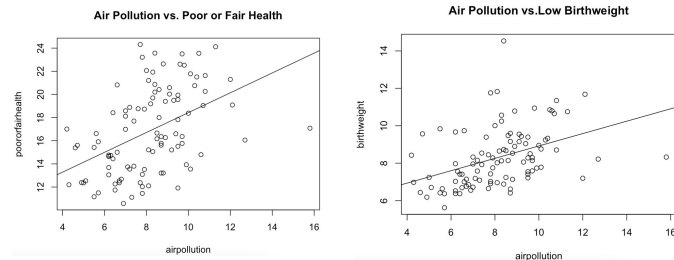

Figure 2: Scatter plots of relevant variables.

Discussion

Our results highlight the range of indirect factors, including air pollution, that impact personal and community health. The findings indicate that air pollution is likely a factor that contributes to worsened general health in a community, especially in communities that experience more childhood poverty. More specifically, it is likely that communities that experience higher percentages of childhood poverty are more likely to suffer more serious and detrimental health effects as a result of air pollution, and thus present higher rates of poor or fair general health (in the adult population). Together, our findings strengthen current knowledge regarding the importance of environmental and socioeconomic factors in physical health.

Future Direction

The addition of our results on a mounting pile of evidence indicating that concerning levels of air pollution need to be addressed, especially in vulnerable communities, should act as a catalyst for updated air pollution regulations and policy and additional allocation of health resources to underserved communities. Looking ahead, we hope to further investigate the impacts of other indirect factors that may exacerbate the damaging effects of air pollution.

Acknowledgements

1 U.S. Department of Health and Human Services. (2021, August 30). *Air Pollution and Your Health*. National Institute of Environmental Health Sciences. Retrieved September 28, 2021, from https://www.niehs.nih.gov/health/topics/agents/air-pollution/index.cfm.