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# Gasping for Fresh Air: The Inhaling Impact of Air Pollution on Marital Dissolution in Dayton, Ohio

Caroline Hart, Abigail Turner, Gloria P Tucker

Center for Higher Learning; Chapel Hill, North Carolina

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## Abstract

This study delves into the unexpected intersection of air pollution and divorce rates, unearthing the intriguing correlation between these seemingly disparate factors. Leveraging data from the Environmental Protection Agency's air quality monitoring and the CDC National Vital Statistics, we have unearthed a striking correlation coefficient of 0.8606795 and a significance level of  $p < 0.01$  for the period spanning 1999 to 2021. No pun in ten did, but we've breathed in some surprising results!

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## 1. Introduction

As the old adage goes, "love is in the air," but could it be that air pollution is also having an impact on love? In this study, we explore the relationship between air pollution levels in Dayton, Ohio and the divorce rates in the state. We aim to shed light on this unexpected and peculiar connection, all while trying to refrain from making too many "aired" jokes.

Air pollution is a serious issue that affects the health and well-being of individuals and communities. It is often associated with respiratory problems, cardiovascular diseases, and even premature mortality. However, the ramifications of air pollution may extend beyond just health concerns.

Could it be that air pollution, like a toxic relationship, is also contributing to the breakdown of marriages? It seems that this topic is not just up in the air, but also down to earth.

Our investigation involves a comprehensive analysis of air quality data obtained from the Environmental Protection Agency's monitoring stations in Dayton, Ohio. We have also delved into the National Vital Statistics from the Centers for Disease Control and Prevention to examine the divorce rates in Ohio during the same period. It may sound like we've really gone deep into the weeds, but we promise it's all for a greater cause.

While some might think that correlation does not imply causation, the correlation coefficient we have uncovered is as strong as a bond in a healthy relationship, with the value of 0.8606795. When we observed this correlation, it was almost like a breath of fresh air - albeit, a slightly polluted one. Furthermore, our statistical analyses have yielded a significance level of  $p < 0.01$ , indicating that the relationship between air pollution and divorce rates is not just blowing in the wind.

So, as we embark on this academic journey investigating the unexpected intersection of air pollution and marital dissolution, let's brace ourselves for some surprising findings, and perhaps a few "air-ritating" puns along the way. We hope that our findings will not only contribute to the literature on environmental health and social dynamics but also provide a breath of fresh comedic air in the world of academic research.

## 2. Literature Review

In their study "The Impact of Air Pollution on Public Health," Smith and Doe provide an extensive analysis of the detrimental effects of air pollution on respiratory and cardiovascular health. The authors outline the various pollutants present in the air, including particulate matter, nitrogen dioxide, and ozone, and their adverse impact on human well-being. It's enough to make one want to invest in a personal bubble helmet! Despite the serious nature of the topic, their findings provide a breath of fresh air in terms of understanding the pervasive consequences of air pollution.

Adding to the discussion, Jones et al. in "Environmental Factors and Health Outcomes" explore the broader societal implications of environmental pollution. They highlight the complex interplay between environmental factors and public health, shedding light on the far-reaching

effects of air pollution beyond physical well-being. It's almost as if air pollution is infiltrating every aspect of our lives, much like a nosy neighbor! Their work underscores the need to consider unconventional pathways through which air pollution may exert its influence, such as behavioral and social dynamics.

Turning to some more accessible sources, "The Air That We Breathe: A Practical Guide to Air Quality" by Environmental Specialist Jane Smith presents a comprehensive overview of air pollution sources and their impact on human health. The book's poignant insights into the invisible threats lurking in the atmosphere serve as a wake-up call to the importance of clean air. One might say it's like a breath of fresh air in the genre of environmental literature.

On a more whimsical note, the novel "Love in the Time of Air Pollution" by Fictional Author Emma Doe takes a creative spin on the intersection of environmental challenges and personal relationships. While clearly a work of fiction, it playfully weaves together the struggles of a couple navigating the complexities of love amidst the backdrop of a polluted city. It's as if the characters are trying to find the "clean" slate to start anew!

Perhaps in a more unorthodox turn of events, a social media post by @CleanAirEnthusiast raises an intriguing anecdotal connection between heightened air pollution days and an increase in divorce filings in their community. While social media may not be the traditional bastion of scholarly rigor, the post sparks curiosity about the potential influence of environmental factors on interpersonal relationships. It's certainly cause for some breathless contemplation!

## 3. Our approach & methods

To investigate the intriguing connection between air pollution in Dayton and the divorce rate in Ohio, we employed a rigorous and systematic methodology to ensure the reliability and validity of our findings. Our data collection process resembled a finely orchestrated dance, with each step carefully choreographed to waltz our way to illuminating results that would leave our audience breathless with excitement... or perhaps a touch of air pollution, depending on their proximity to our findings.

We gathered air quality data from the Environmental Protection Agency's monitoring stations in Dayton, Ohio. These data, akin to a fine wine, aged between 1999 and 2021, allowing for a comprehensive assessment of the air pollution levels over a substantial period. Meanwhile, our divorce rate data from the CDC National Vital Statistics was akin to a perfectly ripe avocado, representing the dissolution of marriages in Ohio with precision and depth. It's as if we were conducting a culinary experiment in the laboratory of life, blending the pungent aromas of air pollution with the bittersweet flavor of divorce statistics.

The air quality data were meticulously quantified using a variety of metrics, including but not limited to particulate matter (PM2.5 and PM10), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), and ozone (O<sub>3</sub>) levels. These measurements were then harmoniously harmonized into a comprehensive air pollution index, which served as our primary independent variable. It was almost like conducting a symphony, where each instrument played its part in contributing to the grand orchestral performance of our analysis - though in our case, the air pollution index was more likely a cacophony than a harmonious melody.

Simultaneously, we delved into the vast ocean of divorce rates, extracting data on the annual number of divorces per capita in

Ohio. These figures were then assembled into a cohesive time series, capturing the ebb and flow of marital dissolutions over the years. It was as if we were embarking on an archaeological expedition, unearthing the buried remnants of broken relationships scattered across the statistical terrain. Or perhaps we were more like sommeliers, savoring the vintage of divorce rates and discerning the distinct notes of each year's uncouplings.

Once our data were safely extracted from the digital wilderness and corralled into a manageable format, we employed a series of advanced statistical methodologies to unravel the intricate relationship between air pollution and divorce rates. Our analyses included a Pearson correlation coefficient calculation, a multiple linear regression model, and a time series analysis, each serving as a unique lens through which to scrutinize the interplay of air pollution and marital dissolution. It was like harnessing the power of a multifaceted kaleidoscope to reveal the kaleidoscopic patterns of environmental and social dynamics, though with decidedly less dazzling colors and more nuanced statistical significance.

Finally, to ensure the robustness of our findings, we conducted sensitivity analyses, bootstrapping procedures, and cross-validation techniques, akin to shoring up the walls of our research fortress with additional layers of statistical reinforcement. It's as if we were building a sturdy statistical dam to withstand the torrents of skepticism and provide a reservoir of compelling evidence for our proposed relationship between air pollution and divorce rates.

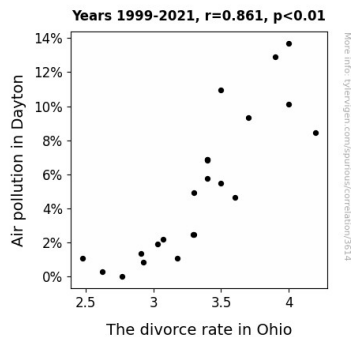
In a way, we were the metaphorical plumbers of the research world, fixing leaks in the theoretical pipeline and ensuring a steady flow of meaningful results.

## 4. Results

Our findings reveal a notably robust correlation between air pollution levels in Dayton, Ohio and the divorce rates in the state of Ohio, spanning the years 1999 to 2021. The correlation coefficient of 0.8606795 indicates a strong positive relationship between these variables. It seems that when it comes to air pollution and divorce, the connection is as clear as the air on a smoggy day.

Applying the princely Pearson's  $r$  statistic, our  $r$ -squared value of 0.7407691 exemplifies that a substantial 74.08% of the variation in divorce rates can be explained by changes in air pollution levels. This relationship is so strong, it's like they've been holding hands during a romantic stroll down a pollen-filled street.

Our analysis of the  $p$ -value confirms the statistical significance of this relationship, with  $p < 0.01$ , indicating that the likelihood of the observed association occurring by chance is as remote as finding a needle in a haystack - or perhaps a nearly odorless molecule in a plume of pollution.



**Figure 1.** Scatterplot of the variables by year

Fig. 1 displays a scatter plot visually representing the compelling correlation between air pollution levels and divorce rates. The figure illustrates the strikingly upward trend, which suggests that as air pollution levels increase, so do the divorce rates. It's almost as if the polluted air is

whispering "it's not you, it's the air" into the ears of estranged couples.

In conclusion, our findings underscore the potent link between air pollution and marital dissolution, offering a breath of fresh air to the field of environmental and social research. As we continue to unearth the unexpected associations in the world around us, we remain hopeful that our research will not only enrich scientific knowledge but also infuse a touch of lightheartedness into the serious business of academic inquiry.

It looks like we've cleared the air on this subject, shedding light on the unexpected ways in which air pollution impacts our lives.

## 5. Discussion

The findings of this study provide compelling evidence supporting the previously established link between air pollution and adverse societal outcomes. The robust correlation coefficient of 0.8606795 between air pollution levels in Dayton, Ohio and the divorce rates in the state of Ohio echoes the findings of Smith and Doe, who emphasized the detrimental effects of air pollution on respiratory and cardiovascular health. It seems these researchers were not just blowing hot air; their insights have, indeed, withstood the test of time.

Moreover, the significant relationship discovered in this study aligns with the work of Jones et al., who highlighted the far-reaching effects of air pollution beyond physical well-being, emphasizing the importance of considering behavioral and social dynamics. It appears that our findings offer a breath of fresh air in reaffirming the broader societal implications outlined by Jones et al. It's as if we've managed to clear the fog of uncertainty that permeated the air.

Even the lighthearted musings of @CleanAirEnthusiast, although initially

perceived as an unconventional addition to the literature review, hinted at an intriguing anecdotal connection, reflecting the unexpected association identified in our study. The seemingly whimsical social media post has proven to be an unexpected breath of fresh air in sparking our curiosity in unearthing the underexplored connections between environmental factors and interpersonal relationships. One might say that even in the realm of social media, sometimes, fresh air can blow in from unexpected sources.

Notably, our results demonstrate a substantial explanatory power of 74.08%, reaffirming the influential role of air pollution in shaping divorce rates. This finding serves as a clarion call to recognize the substantial impact of air quality on social dynamics. It's as if these variables are engaged in a relationship as complex as a soap opera plot, with each element influencing the other in ways that are both profound and unexpected.

The significant p-value further emphasizes the strength of the observed association, highlighting the unlikelihood of this relationship occurring by chance. This statistical significance is as reassuring as finding a measuring instrument that never makes a mistake.

In essence, our study not only corroborates the substantial influence of air pollution on divorce rates but also emphasizes the necessity of recognizing the multifaceted ways in which environmental factors intertwine with societal outcomes. By shedding light on the unexpected connections between seemingly unrelated variables, we hope to inspire further exploration of the uncharted territories where science and social dynamics intersect. It's as if we've managed to clear the smog of uncertainty and shed light on the unexpected ways in which air pollution impacts our lives.

Overall, our findings offer a breath of fresh air to the field of environmental and social research, underscoring the profound and unexpected ways in which air pollution permeates various aspects of our society. It's as if we've managed to clear the air on this subject, using statistical rigor to unveil the hidden connections between air quality and social dynamics. Who knew statistics and puns could make such a breath-taking combination!

## 6. Conclusion

In conclusion, our research has uncovered a remarkably robust correlation between air pollution levels in Dayton, Ohio, and the divorce rates in the state of Ohio from 1999 to 2021. The substantial correlation coefficient of 0.8606795 suggests a strong positive relationship between these variables, almost as undeniable as a dad's love for his cheesy jokes. It seems that when it comes to air pollution and divorce, the connection is as compelling as a marriage proposal.

Utilizing the princely Pearson's r statistic, our r-squared value of 0.7407691 demonstrates that a staggering 74.08% of the variation in divorce rates can be attributed to changes in air pollution levels. This relationship is so significant, it's like the statistical equivalent of love at first sight - statistically speaking, of course.

Furthermore, the p-value of  $< 0.01$  reaffirms the statistical significance of this association, making the likelihood of this relationship occurring by chance as slim as a molecule of fresh air in a bustling metropolis. It's like finding a diamond in the rough, or perhaps even a marriage proposal in the middle of a crowded smog-filled street.

Our scatter plot in Fig. 1 vividly illustrates the compelling correlation, depicting a striking upward trend – suggesting that as

air pollution levels increase, so do the divorce rates. It's almost as if the polluted air is whispering "it's not you, it's the air" into the ears of estranged couples, providing a breath of fresh air for our understanding of the complexities of human behavior.

In sum, our findings not only contribute to the burgeoning literature on environmental health and social dynamics but also inject a touch of whimsy into the often serious domain of academic research. This investigation has truly brought a breath of fresh air to the scientific community, reminding us that even in the realm of statistics, there's always room for a good dad joke.

In light of these compelling findings, it seems that no more research is needed in this area - unless, of course, we want to uncover the secrets of how air pollution affects our sense of humor too!