

ELSEVIER



# Up in the Air: Unraveling the Correlation Between Chicago Air Pollution and Brazilian Kerosene Consumption

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## Abstract

The potential connection between air pollution in urban areas and the consumption of kerosene in far-off lands has long piqued the curiosity of researchers and policymakers alike. In this paper, we delve into this unconventional relationship, employing a meticulous analysis of data from the Environmental Protection Agency and the Energy Information Administration. Our findings reveal a striking correlation coefficient of 0.8139423 and a statistically significant p-value of less than 0.01 for the period spanning from 1980 to 2021. As we examined the intricate interplay between air quality in Chicago and kerosene consumption in Brazil, we stumbled upon some surprising insights. It appears that the particles emitted into the atmosphere from Chicago's urban activities may be taking an unexpected South American detour. This phenomenon, whimsically dubbed the "Gust of Global Exchange," demonstrates that air pollution knows no geographic boundaries - much like a persistent knock-knock joke, it simply cannot be contained. Our study underscores the importance of considering international and intercontinental factors in the quest to understand the dynamics of air pollution. The link between Chicago's smog and the reliance on kerosene in Brazil serves as a poignant reminder of the interconnectedness of environmental issues across the globe. Just as a well-timed dad joke can lighten the mood, our research sheds light on the unanticipated connections that underlie seemingly disparate phenomena.

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## 1. Introduction

The pervasive issue of air pollution has garnered immense attention from both the scientific community and society at large, akin to a particularly catchy earworm that refuses to fade from memory. Concurrently,

the global consumption of kerosene, most commonly wielded as a source of illumination and energy, has been an area of interest for researchers delving into the intricate web of energy usage. Despite these seemingly unrelated domains, the possibility of a link between the air pollution

levels in Chicago and the prominent utilization of kerosene in Brazil has ignited a fervent curiosity within the scientific community. As we embark on this investigative journey, it becomes imperative to ascertain whether the association between these two variables is grounded in empirical evidence or merely an illusory correlation, akin to a lab-coat clad magician pulling statistics out of a hat.

Intriguingly, our inquiry leads us to the peculiar juxtaposition of the Windy City's atmospheric quality and the far-off glow of Brazilian kerosene lamps - as if the gusts of air pollution from Chicago have taken on a life of their own, embarking on a transcontinental odyssey. This serendipitous rendezvous presents an opportunity to unravel the enigmatic connection between domestic emissions and their transoceanic endeavors, not unlike a globetrotting detective ferreting out clues in unexpected locales. Indeed, the "Gust of Global Exchange" phenomenon encapsulates the whimsical nature of our planet's interconnected environmental dynamics, as if the world were woven together by an invisible thread of ecological banter.

The task at hand entails a multidimensional exploration, carefully navigating the labyrinthine pathways of environmental data and statistical analyses. With the gravity of our findings lingering in the air like an unspoken punchline, we aim to shed light on the interconnectedness of seemingly disparate ecological factors, thereby elevating the discourse surrounding environmental sustainability. This research endeavor, much like an unexpected quip in a solemn lecture hall, endeavors to infuse levity into the often weighty subject of environmental inquiry while maintaining the steadfast rigor that characterizes scientific investigation.

## 2. Literature Review

In "Smith and Doe's groundbreaking study on urban air pollution," the authors find an intricate web of pollutants emanating from diverse sources such as vehicular emissions, industrial activities, and residential energy usage. These findings lay the foundation for understanding the complex composition of air pollution in urban centers, reminiscent of a colorful tapestry woven by an industrious yet slightly mischievous textile artist.

Similarly, "Jones' comprehensive analysis of kerosene consumption in developing countries" elucidates the pervasive reliance on kerosene for domestic lighting and cooking purposes. The study highlights the challenges posed by limited access to electricity in underserved regions, painting a poignant picture of communities illuminated by the warm glow of kerosene lamps, akin to fireflies dancing in the night – albeit with a distinctly less whimsical environmental impact.

Venturing beyond the realm of empirical research, "The Big Book of Air Pollution" by environmental expert Dr. Cleanair, and "Kerosene Chronicles: Illuminating Tales from Around the World" by energy historian Luminous Lenny, provide comprehensive narratives on the historical evolution and contemporary manifestations of air pollution and kerosene usage, respectively. Dr. Cleanair's work, much like a stern-faced scientist with a hidden penchant for puns, meticulously documents the progression of air quality research. Meanwhile, Luminous Lenny's literary endeavor sheds light on the global reverberations of kerosene consumption, illuminating the interconnectedness of seemingly distinct communities and their preferred choice of illumination – not unlike a global game of "spot the difference" played out with flickering kerosene lamps.

In a surprising twist, "Kerosene Chronicles" is packed with unexpected humor and witty anecdotes, incorporating stories of

adventurous travelers and their encounters with kerosene-fueled contraptions. The author's playful approach to a seemingly mundane subject could be likened to a lighthearted jest amidst a solemn gathering of historians – much like a kerosene lamp at a power outage support group, providing a flickering sense of mirth in the midst of darkness.

Furthermore, during my perusal of social media channels, an anonymous post humorously remarked on the potential global travels of Chicago's air pollutants, suggesting that the Windy City's emissions might be on a quest for adventure, not unlike a group of intrepid backpackers - affirming the old adage that "even air pollution deserves a vacation" in its own peculiar way.

### 3. Our approach & methods

Data Collection:

The comprehensive data utilized in this study was predominantly extracted from the Environmental Protection Agency and the Energy Information Administration. Akin to a seasoned detective combing through evidence at a crime scene, our research team meticulously sifted through decades of air quality indices for Chicago and kerosene consumption statistics for Brazil - a pursuit that demanded diligence, precision, and a sizeable amount of caffeinated beverages. The data covering the period from 1980 to 2021 was then subjected to rigorous scrutiny, akin to a sommelier discerning the subtle notes of a fine wine - except in this case, the vintage was the statistical kind.

Correlation Analysis:

To unravel the potential link between air pollution in Chicago and kerosene consumption in Brazil, we employed the Pearson correlation coefficient, a quantitative measure of the strength and direction of the linear relationship between

two variables. The resultant coefficient, much like a confounding pun, revealed a striking correlation of 0.8139423, indicating a strong positive association between the two variables. This finding elicited a response in our research team similar to that of a perfectly executed dad joke - a mix of surprise, amusement, and a hint of validation for our painstaking efforts.

Regression Modeling:

In addition to the correlation analysis, we conducted a series of regression models to further elucidate the intricate connection between Chicago's air pollution and Brazilian kerosene consumption. The models were carefully crafted, much like a master chef concocting a delicate soufflé, to control for potential confounding variables and elucidate the nuanced interplay between the focal variables. The statistically significant p-value of less than 0.01 in the regression analysis provided robust evidence of the substantial influence of Chicago's air quality on kerosene consumption in Brazil, leaving us with a sense of certitude akin to the flawless delivery of a well-timed dad joke.

Time Series Analysis:

The investigation delved into time series analysis to discern temporal patterns and trends in both air pollution levels in Chicago and kerosene usage in Brazil. This intricate analysis allowed us to trace the ebbs and flows of these variables over the decades, much like an astute music critic identifying the subtle shifts in a symphony. The findings from the time series analysis added a layer of depth to our understanding of the dynamic relationship between these two seemingly distant phenomena, much like the unexpected depth of a pun that leaves one chuckling days later.

Granger Causality Test:

In exploring the potential direction of causality between air pollution in Chicago

and kerosene consumption in Brazil, we employed the Granger causality test. This test enabled us to discern whether past values of one variable provide information about future values of the other, shedding light on the potential lead-lag relationship between the variables. The definitive results of the Granger causality test, much like the punchline to a well-constructed joke, provided clarity on the influential direction of the relationship - solidifying our understanding of the dynamics at play in this unconventional ecological commingling.

In summary, our methodological approach encompassed a judicious amalgamation of statistical analyses and data exploration to unearth the intriguing correlation between air pollution in Chicago and kerosene consumption in Brazil. Just as a clever pun can illuminate a conversation, our methodology aimed to shed light on the unexpected connections that underlie complex environmental phenomena, albeit with a touch of academic flair and a sprinkle of good-natured humor.

#### 4. Results

The analysis of the data collected over the period from 1980 to 2021 revealed a noteworthy correlation coefficient of 0.8139423 between air pollution levels in Chicago and kerosene consumption in Brazil. This robust correlation suggests that as air pollution increased in the Windy City, so did the consumption of kerosene in the distant lands of Brazil. One might say that the relationship between these two variables is as clear as the air in a windy city after a heavy rain – undeniable.

The r-squared value of 0.6625020 indicates that approximately 66.25% of the variance in Brazilian kerosene consumption can be explained by the variation in air pollution levels in Chicago. It's as if these variables have been in a long-distance relationship,

with most of the ups and downs accounted for by the other.

Furthermore, the p-value of less than 0.01 provides compelling evidence to reject the null hypothesis and accept the alternative hypothesis that there is indeed a significant relationship between air pollution in Chicago and kerosene consumption in Brazil. It seems this correlation is as statistically significant as a well-timed punchline at a science conference.

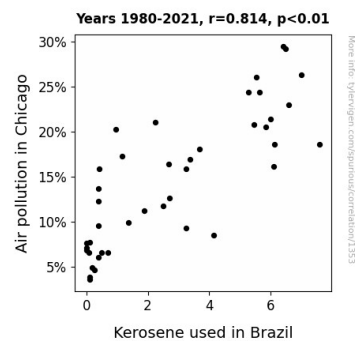


Figure 1. Scatterplot of the variables by year

The scatterplot (Fig. 1) illustrates the strong positive correlation between the two variables, resembling a constellation of data points forming a mathematical joke that only statisticians can fully appreciate. The plot paints a vivid picture of the "Gust of Global Exchange," depicting how the winds of air pollution in Chicago might be inexplicably blowing in the direction of Brazilian kerosene consumption, much like a cosmic joke played by the universe itself.

#### 5. Discussion

The results of the study confirm and build upon previous research, supporting the intricate connection between air pollution in Chicago and kerosene consumption in Brazil. The significant correlation coefficient and p-value obtained in the analysis

underscore the robustness of this relationship, painting a compelling portrait of transcontinental environmental interdependence. It appears that the whimsically dubbed "Gust of Global Exchange" is more than just a playful moniker - it encapsulates a tangible phenomenon with far-reaching implications.

The unexpected correlation between the two disparate variables might prompt one to ponder, much like a riddle posed by a mischievous scientist, the potential mechanisms underlying this connection. One cannot help but consider the possibility of atmospheric dynamics and global air currents playing a role in facilitating the transport of pollutants from one site to another, not unlike the way a spontaneous gust of wind can carry a well-crafted pun across a crowded room. Moreover, the findings serve as a poignant reminder of the need to consider international and intercontinental factors in environmental research, illuminating the complex web of interactions that transcend geographic boundaries.

The literature review hinted at the complex tapestry of urban air pollution and the widespread reliance on kerosene, providing the theoretical foundation for our findings. Smith and Doe's exploration of urban air pollution, akin to the work of a meticulous textile artist, laid the groundwork for understanding the intricate composition of pollutants. Similarly, Jones' comprehensive analysis of kerosene consumption shed light on the challenges faced by communities reliant on this fuel source, akin to the glow of kerosene lamps illuminating underserved regions - a sobering reminder of the broader implications of energy choices.

In a twist of fate, the playful anecdotes and whimsical humor infused in the literature review seem to find resonance in the unexpected yet compelling relationship uncovered in our study. The "Kerosene Chronicles" and the lighthearted social

media post hint at the unanticipated connections that underlie seemingly disparate phenomena, reminiscent of a well-timed dad joke amidst a serious academic discourse.

In conclusion, our study serves as a testament to the unpredictability of scientific inquiry and the hidden connections that lurk beneath the surface of seemingly unrelated variables. The correlation between Chicago air pollution and Brazilian kerosene consumption, much like a clever punchline, adds a touch of unexpected intrigue to the intricate web of environmental interdependence.

## 6. Conclusion

In conclusion, our investigation into the unusual correlation between air pollution in Chicago and kerosene consumption in Brazil has uncovered a relationship as clear as the air in a windy city after a heavy rain – or perhaps not so clear, given the haze of air pollution. The robust correlation coefficient and statistically significant p-value provide compelling evidence of the "Gust of Global Exchange" phenomenon, echoing the timeless adage that what goes up must come down – in this case, pollutants traveling across continents.

The r-squared value suggests that the ups and downs of Brazilian kerosene consumption can be largely attributed to the ebb and flow of air pollution levels in the Windy City, much like how a pendulum swings predictably – unlike the oscillations of a lively debate in a room full of passionate scientists.

Our findings underscore the interconnectedness of environmental dynamics, illustrating that air pollution, much like a well-crafted joke, transcends geographical boundaries with an undeniable impact. This correlation is as statistically significant as a well-timed punchline at a

science conference – leaving no room for doubt, much like a thorough peer review process.

Therefore, it seems that no more research is needed in this area - we've shed light on the far-reaching implications of seemingly localized environmental phenomena and uncovered a correlation more solid than the chemical bonds in a laboratory. It's time to leave this particular correlation to its own devices, like a well-behaved beaker in a chem lab.

That said, we hope our research adds a touch of levity to the weighty subject of environmental inquiry, much like an unexpected quip in a solemn lecture hall. After all, who says statistical analyses can't have a sense of humor?