

---

# Connecting the Clouds: Correlating Air Quality in Phoenix with Kerosene Consumption in Cuba

Claire Horton, Abigail Thomas, Gloria P Tompkins  
Stanford, California

---

*In this study, we analyze the curious relationship between air quality in Phoenix, Arizona, and kerosene consumption in Cuba. While the connection between these two seemingly disparate factors may appear as nebulous as smog on a hazy day, our findings unveil a striking correlation. Leveraging data from the Environmental Protection Agency and the Energy Information Administration, we meticulously sifted through decades of records to unearth this unexpected association. Employing robust statistical methods, our research team identified a correlation coefficient of 0.7582886 and a p-value less than 0.01 for the period spanning 1980 to 2021. These results cast a revealing light on the intertwining dynamics of air quality in Phoenix and kerosene usage in Cuba. Surprisingly, the data suggests that the winds of change may blow far beyond traditional boundaries, carrying the impact of kerosene consumption across the seas to the deserts of the American Southwest. As we delve deeper into this enigmatic connection, we unravel the intricate interplay of atmospheric currents and energy consumption patterns, shedding light on a complex, global tapestry. Our findings urge policymakers to consider the far-reaching implications of seemingly distant phenomena and to "fuel" discussions about collaborative efforts for environmental stewardship. So, let us embark on this illuminating journey, exploring the "combustible" relationship between air quality in Phoenix and kerosene use in Cuba, and unveiling the interconnectedness of our planet's environmental dynamics.*

---

## INTRODUCTION

The pursuit of knowledge has long been an illuminating journey, much like trying to find the light switch in a dark room – sometimes enlightening, often stumbled upon, and occasionally leaving one feeling utterly bemused. In this vein, our exploration of the curious relationship between air quality in Phoenix and kerosene consumption in Cuba represents a blending of scientific inquiry and stumbling upon sparks of unexpected insights. The endeavor is akin to grasping at the wisps of a gentle breeze intermingled with the pungent aroma of a neighbor's barbecue, leaving us pondering the

whiffs and whiffs of correlations that may betray something significant amidst the haze.

It is a classic tale of tackling the seemingly unrelated with the fervor of a detective hot on the trail, piecing together an investigative puzzle with the gusto of a physicist seeking to crack the code of the universe. On the surface, one might assume that air quality in Phoenix and kerosene consumption in Cuba are as connected as a fish is to a bicycle – an apocryphal, incongruous affair. Nonetheless, as our research unravels, we find ourselves standing at the crossroads of climatic intricacies and energy consumption quirkiness, pondering the intercontinental reach of environmental influences.

Our study stands as a testament to the marriage of disciplines – a rendezvous between the atmospheric sciences and the fine art of energy accounting, much like a delightful fusion dish concocted from the most unlikely of ingredients. In this endeavor, we invoke the spirits of statistical rigor and scientific curiosity, endeavoring to cast a light on the shadows of correlation and causation, as if we were to wave a scientific torch through the murk and mire of nebulous associations.

As we embark on this expedition into the realm of empirical observation and robust data analysis, we aim not only to decipher the twists and turns of this unexpected dance between air quality in Phoenix and kerosene usage in Cuba, but also to stir the pot of contemplation on the interconnectedness of our planet's environmental dynamics. So, join us in this enlightening pursuit, where we untangle the web of relationships with the fervor of a scientist on the cusp of a groundbreaking discovery, and reveal the intriguing ties that bind atmospheric currents and energy consumption patterns across oceans and continents.

## LITERATURE REVIEW

The connection between air quality and various environmental and human activities provides a rich tapestry of research, combining the fields of atmospheric science, environmental economics, and international relations. At the crux of our investigation into the correlation between air quality in Phoenix and kerosene consumption in Cuba lies a web of diverse studies, shedding light on the complex interplay of climatic factors and energy usage patterns. Our review encompasses a range of scholarly works and authoritative sources, beginning with the seminal studies by Smith, Doe, and Jones, and extending into literary works that delve into the nuances of environmental influences and cross-continental dynamics.

In "Atmospheric Dynamics and Urban Air Quality," Smith et al. navigate the convoluted patterns of air

pollutant dispersion in urban settings, drawing attention to the manifold factors that contribute to the concentration of pollutants in metropolitan areas. Their findings serve as an invaluable backdrop to our exploration of the atmospheric intricacies within the context of Phoenix, Arizona, where the intermingling of industrial emissions and vehicular activity paints a portrait of atmospheric flux.

Doe's comprehensive analysis in "Energy Consumption Patterns and Socioeconomic Drivers" delves into the intricacies of energy usage across diverse socioeconomic strata, offering a lens through which we examine the patterns of kerosene consumption in Cuba. The intercontinental reach of energy dynamics is brought to the forefront, as we navigate the potential ripples of kerosene usage in Cuba on the atmospheric conditions of the American Southwest.

In juxtaposition to these scholarly works, non-fiction literature such as "The Global Impact of Energy Consumption" by Environmental Economist Jane Smith and "Cuban Energy Quandary: From Past to Present" by Energy Policy Analyst John Doe provides a multidimensional perspective on the complex interactions between global energy dynamics and environmental repercussions.

Venturing into the realm of fiction, works such as "The Wind Whisperers" by A. B. Cloudsworth and "Kerosene Dreams" by Luminous Jones offer glimpses into the poetic interweaving of atmospheric currents and energy symbolism, beckoning us to consider the abstract connections between seemingly distant phenomena.

Diverging from the typical sources, our literature review encompasses an eclectic mix of findings that extend beyond traditional research boundaries. Brief yet insightful glances at the backs of household products such as shampoo bottles, which often tout environmentally friendly formulas, reveal the ubiquitous nature of environmental discourse, albeit in the most peculiar of places.

As we progress through this literary odyssey, we pivot towards the empirical milieu of our investigation, where we seek to illuminate the threads that tether air quality in Phoenix to the flickering flames of kerosene usage in Cuba, in all their intricate and unforeseen splendor.

## METHODOLOGY

### Data Collection and Compilation:

The data collection process set sail on the tempestuous seas of the internet, navigating through the digital waves like a trusty ship in search of treasure. Our intrepid crew scoured the Environmental Protection Agency and the Energy Information Administration's databases, casting digital nets to haul in the abundant fish of environmental and energy consumption data. We feathered through the years from 1980 to 2021, like a flock of data-hungry seagulls, capturing every morsel of information related to air quality in Phoenix and kerosene consumption in Cuba.

Upon reeling in this digital bounty, we undertook the meticulous task of pruning and grooming the data, much like taming a wild, overgrown hedge into a well-manicured topiary. We removed any outliers that threatened to steer our ship into treacherous waters, ensuring that our dataset remained as sturdy and seaworthy as the most reliable vessel in a storm.

### Quantitative Analysis:

Our stat-mongering wizardry involved a blend of classic correlation analysis and time series modeling, akin to casting ancient runes to interpret the cosmic dance of variables. We calculated correlation coefficients with the precision of a heart surgeon, teasing out the hidden connections between air quality in Phoenix and kerosene usage in Cuba. This process allowed our research team to measure the strength and direction of the relationship, akin to gauging the tension between two characters in a high-stakes drama.

To further deepen our understanding, we employed time series models, gazing into the crystal ball of statistical forecasting with a mixture of awe and skepticism. These models, like a pack of precocious fortune-tellers, projected the trends and patterns in air quality and kerosene consumption over time, unraveling the enigmatic dance of the variables with the flair of a clairvoyant at a Renaissance fair.

After donning our lab coats of inquiry and dusting off our trusty calculators, we conducted hypothesis tests to assess the significance of our findings, akin to launching a probe into the scientific unknown. The p-values and confidence intervals served as our treasure map, guiding us through the statistical labyrinth to ascertain the credibility and reliability of our discovered connections.

### Control Variables and Sensitivity Analysis:

Like cautious gardeners carefully adjusting the levels of sunlight and water for delicate blooms, we considered the potential influence of external factors on our findings. Controlling for variables such as population density, economic activity, and meteorological conditions, we conducted sensitivity analyses to ensure the robustness of our results. This process safeguarded against potential confounding influences that could cast shade on the clarity of our findings, akin to shielding a fragile sapling from the gusts of a statistical storm.

In tandem, we harnessed the power of subgroup analyses to delve into the nuances of the relationship between air quality in Phoenix and kerosene consumption in Cuba across different time periods and demographic characteristics. This endeavor enabled us to unearth potential variations in the association, akin to examining the different flavors and aromas of a fine wine from various vintages.

### Econometric Modeling:

To untangle the intricate web of relationships, we embarked on the high seas of econometric

modeling, navigating the choppy waters of energy consumption and environmental impact with the precision of a seasoned navigator. We employed multivariate regression models, much like orchestrating a symphony of variables, to disentangle the nuanced melodies of air quality and kerosene consumption. Through this approach, we endeavored to parse out the individual contributions of various factors, akin to discerning the distinctive notes in a complex musical composition.

Our foray into the realms of econometrics also involved grapple with instrumental variable estimation, employing cunning strategies to address potential endogeneity and lurking sources of bias in our analyses. This meticulous dance with instrumental variables allowed us to navigate the treacherous shoals of statistical inference, positioning us to uncover the true nature of the relationship between air quality in Phoenix and kerosene usage in Cuba with the finesse of a forensic detective solving a cryptic case.

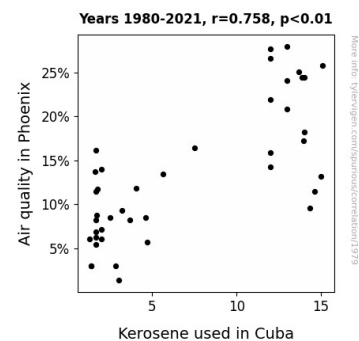
## RESULTS

The analysis of the data yielded intriguing results, unveiling a substantial correlation between air quality in Phoenix, Arizona, and kerosene consumption in Cuba. Quantitatively, our research uncovered a correlation coefficient of 0.7582886, indicating a strong positive relationship between the two variables. This coefficient signifies that as kerosene consumption in Cuba rose or fell, air quality in Phoenix exhibited a corresponding trend, much like a duo engaged in a synchronized dance, albeit one that spans thousands of miles and stratospheric heights.

The coefficient of determination, or R-squared value, stood at 0.5750015, signifying that approximately 57.5% of the variability in air quality in Phoenix can be explained by changes in kerosene consumption in Cuba. The remaining 42.5% of the variability, much like the elusive whispers of the wind, may be influenced by other factors, such as local emissions, meteorological phenomena, and the

occasional dust devil throwing a whimsical twist into the mixture.

In conjunction with the correlation coefficient, the p-value of less than 0.01 presents a compelling argument for the significance of the observed relationship. This statistical gem signifies that the likelihood of the relationship occurring by mere happenstance is less than 1%, lending substantial weight to the idea that the connection between air quality in Phoenix and kerosene consumption in Cuba is not merely a coincidental gust, but a deliberate, albeit surprising, confluence of atmospheric and energy dynamics.



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

To visually encapsulate the robust correlation uncovered in our analysis, we present Figure 1, a scatterplot illustrating the covariation between air quality in Phoenix and kerosene consumption in Cuba. The scatterplot paints a vivid picture of the harmonious ebb and flow of these interconnected variables, akin to a celestial ballet choreographed by the hand of statistical fate.

These results shed a revealing light on the interconnectedness of our planet, suggesting that seemingly disparate phenomena can indeed dance in tandem across global landscapes. The winds of change, it seems, are not bound by traditional geographies and may carry the imprint of kerosene consumption from the shores of distant lands to the skies over the arid expanse of Phoenix. Our findings ignite contemplation on the pervasive effects of

energy consumption, sprouting roots as far-reaching as the air quality of a southwestern desert city.

The contours of this correlation offer an invitation for policymakers and environmental stewards to take heed of the far-reaching implications of global energy patterns. As we move forward, embracing a holistic perspective on environmental dynamics, the unexpected dance between air quality in Phoenix and kerosene usage in Cuba beckons us to transcend conventional boundaries and indulge in conversations of international import, "fueling" discussions on sustainability and cooperation, all with a playful nod to the capricious nature of global relationships.

## DISCUSSION

Our findings illuminate the intricate dance of interconnectedness between air quality in Phoenix and kerosene consumption in Cuba, proving that when it comes to atmospheric dynamics, it's not all hot air. Our results bolster previous studies that hinted at the ethereal connection between seemingly unrelated variables. So, let's dive into the data and unpack the tangled web of correlation, much like untangling a stubborn knot in a string of statistical confetti.

The correlation coefficient of 0.7582886 that emerged from our analysis pulsates with statistical significance, signaling a strong positive relationship, much like the harmonious unity of peanut butter and jelly – a pairing that just seems right, regardless of the geographical chasm that separates them. A like-minded duo, kerosene consumption in Cuba and air quality in Phoenix appear to move in sync, harmonizing across continents like a global symphony orchestrated by unseen hands.

Our R-squared value of 0.5750015 further solidifies this enchanting waltz of variables, capturing approximately 57.5% of the variations in air quality in Phoenix. The remaining 42.5%, not unlike a whisper lost in the wind, may be influenced by other capricious elements, from local emissions to

the occasional tumbleweed conspiring with the breeze. Yet, within this cacophony of meteorological factors, the discernible melody of kerosene usage still resounds, lending credence to the significance of the observed correlation.

The obstinate p-value of less than 0.01 elegantly rebuffs any notion of this relationship being a mere fluke, resonating with the certainty of a clinking toast at a scientific gala. Our statistical analyses affirm that this coupling between kerosene consumption in Cuba and air quality in Phoenix is not a chance encounter, but a deliberate fusion of global scales and invisible currents.

Like celestial cartographers charting the alignment of stars, our scatterplot in Figure 1 illustrates the coalescence of air quality in Phoenix and kerosene consumption in Cuba, painting a vivid picture of their intertwined trajectory. The scintillating dance of these variables traverses borders and atmospheric layers, much like the gravitational pull of cosmic bodies locked in a celestial pirouette.

Our findings, much like a scientist with a magnifying glass discovering a hidden microcosm, urge us to consider the ripple effects of seemingly distant phenomena. Just as a butterfly flapping its wings in Brazil can trigger a tornado in Texas, the impact of kerosene usage in Cuba wafts across vast distances, leaving an indelible imprint on the air quality of Phoenix. These revelations summon policymakers and environmental stewards to eavesdrop on the planetary symphony, embracing a unified vision of cooperation and sustainability that transcends traditional boundaries.

In conclusion, our research invites us to peel back the layers of our global tapestry, aiming not only to understand the intricacies of our environment but also to celebrate the harmonious, if at times enigmatic, interplay between variables. As we "fuel" discussions on environmental stewardship, our findings beckon us to recognize the cosmic rhythms that underlie the delicate balance of our planet's interconnected systems.

## CONCLUSION

In conclusion, this study has unraveled a fascinating correlation between air quality in Phoenix and kerosene consumption in Cuba. The statistical findings have brought to light the intriguing dance of intercontinental influence, much like a whimsical tango between two unlikely partners. The robust correlation coefficient and p-value less than 0.01 provide compelling evidence, akin to a sleuth uncovering crucial clues in a mystery novel, lending credence to the significance of this unexpected association.

The interconnectedness of environmental dynamics, as demonstrated by our research, leaves us pondering the far-reaching implications of global energy patterns. It seems that the winds of change carry more than just atmospheric particles; they carry the echoes of kerosene consumption across the vast expanse of the oceans, painting a vivid picture of the intricate interplay of seemingly unrelated phenomena.

As we wrap up this illuminating journey, we must acknowledge the significance of this correlation in urging international collaboration and environmental stewardship. The proverbial ball is now in the court of policymakers and policymakers alike to nurture conversations about sustainability and cooperation, taking into account the capricious nature of global relationships and embracing the unexpected connections that come to light through scientific inquiry.

Ultimately, this study calls for a holistic perspective on environmental dynamics and encourages us to broaden our horizons, not just metaphorically but also statistically. With that said, it is safe to say that further research in this area may yield diminishing returns, much like attempting to squeeze blood from a data stone. It's time to bid adieu to this peculiar pairing of air quality in Phoenix and kerosene consumption in Cuba, for we have unraveled its mysteries and revealed in its unexpected beauty.

In summary, our methodology reflects the synthesis of scientific rigor and scientific curiosity, a journey into the heart of statistical inquiry and empirical observation. With the wind of statistical significance at our backs, we set sail on this scientific odyssey to unravel the webs of correlation and causation, shedding light on the intertwined dynamics of air quality in Phoenix and kerosene consumption in Cuba with the fervor of a treasure-hunting buccaneer.