Impacts of Wildfire Smoke on Asthma in Shreveport, Louisiana

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# 1 - Introduction

The city of Shreveport is the major industrial center that connects the economies of Arkansas, Louisiana, and Texas. Located in Louisiana’s Caddo parish, the city is home to a complex mix of oil, steel, and healthcare industries all supported by its strategic location at the center of the Ark-La-Tex tri-state area1.

However, the city’s location and industries have also brought with them many long-term issues that Shreveport grapples with to this day. The fumes emitted by the city’s persistent oil refinement industry and constantly expanding steel industry have made respiratory conditions like asthma a constant concern in the area2. Though the thriving healthcare industry has managed to accommodate these needs in the past, recent trends show that a new threat to the city has arrived that threatens to exacerbate this already concerning situation.

Over the past 40 years, wildfires have become exponentially more common all across America. And as the city situated is in the lowest, flattest, and most unobstructed terrain of its area, Shreveport has been seen as experiencing a particularly intense rise in wildfire trends3. In addition to the threat posed by wildfires themselves, the smoke pollution produced by wildfires poses a unique risk to Shreveport’s already smoke-sensitive inhabitants. Wildfire smoke contains a mixture of toxic gasses and particulate matter that severely irritates the respiratory system and can lead to fatal complications for individuals with preexisting respiratory conditions4. In a city so rife with industrial pollution already, the impact of this smoke will be felt most by the vulnerable groups in the community that lack the means by which to mitigate or prevent exposure to these toxic emissions. Those lacking medical insurance, air filtration systems, or housing will have no choice but to endure these conditions until they are ultimately hospitalized.

Though municipal funds in Shreveport are stretched tight and closely regulated, there is still room for the city to shift the balance of its finances in response to the appearance of these destructive wildfires. And this analysis will attempt to answer the question of how asthma hospitalizations are expected to change as wildfire rates continue to climb, and to make a concrete recommendation on how the city should allocate its funds to match this evolving situation.

# 2 - Background

## 2.1 - Prior Work

With wildfire rates climbing all across the United States, research into its direct and indirect effects on local populations has received significantly more attention and support from state and federal governments. Such research into the health effects of smoke pollution identifies carbon monoxide and particulate matter as the primary causes of smoke-related health complications4.

Carbon monoxide comprises the bulk of a wildfire’s short-term gaseous emissions. It is a colorless and odorless gas that produces symptoms similar to oxygen deprivation or the flu. In limited quantities, carbon monoxide poisoning can lead to dizziness, headaches, and nausea while in extreme conditions it can lead to loss of consciousness and permanent brain damage5. These effects stem from carbon monoxide’s mechanism of replacing oxygen in red blood cells, thereby cutting off the oxygen supply to the human body. As such, the effects of CO poisoning will be particularly pronounced in vulnerable groups already suffering from respiratory issues such as asthma that affect the availability of oxygen.

However, particulate matter is the emission of greatest concern when considering the long-term impact of wildfires. Unlike carbon monoxide emissions, which are largely localized to the area immediately surrounding the wildfire, particulate matter can propagate far enough to affects multiple nearby states. Particular matter, or PM10, refers to aerosolized matter less than 10 micrometers in diameter that can pass into the lungs and irritate respiratory tissues, leading to an obstructions and difficulty breathing4. Particulate matter less than 2.5 micrometers in size, or PM2.5, even has the potential to enter the circulatory system directly and lead to further health complications such as heart attacks or strokes. These complications once again affect individuals with asthma far more than the general population, with exposure to PM2.5 leading to a significant risk of asthma attacks on its own.

## 2.2 - Research Questions

With so many health risks posed to individuals with respiratory conditions, it is vital that the city of Shreveport carefully consider the allotment of funds when addressing the growing issue of wildfires in the area. To help with making these key decisions, this project will focus on answering two main questions:

1. How closely connected are wildfire smoke and air quality in Shreveport? How Well can one predict the other?
2. Using smoke impacts and historical asthma data as a basis for prediction, how are asthma hospitalization rates expected to change in the coming years for Shreveport?

## 2.3 - Data Sources

For this analysis, three distinct datasets were required. Firstly, a historical dataset on asthma hospitalizations in Shreveport is necessary in order to establish a prior history for our future model to build off of. Secondly, a dataset describing the AQI in Shreveport will be necessary in order to both compare it against smoke impacts in Shreveport and in order to help forecast smoke impacts in Shreveport. And lastly, a dataset quantifying the prior impact of wildfire smoke on Shreveport will be necessary both as a point of comparison against AQI and in order to factor in the effects of this smoke on future rates of asthma.

In order to obtain historical data on asthma hospitalizations in Shreveport, two datasets were considered. Initially, the CDC’s dataset of mortality from respiratory illnesses, available at [Compressed Mortality File 1968-2016 (cdc.gov)](https://wonder.cdc.gov/wonder/help/cmf.html), was considered as a possible source of asthma data. However, this dataset only contained data on respiratory illness mortality and did not address the larger issue of hospitalizations. In Shreveport, the thriving healthcare industry makes it likely that any individual suffering from an asthma attack will be swiftly taken to treatment, but it makes no guarantee that there will be no permanent damage from these attacks nor does it protect financially vulnerable populations from crippling amounts of medical debt. In these circumstances, death is not the only major negative outcome to be avoided. Instead, the Louisiana Department of Health OPH’s Health Outcomes dataset detailing the hospitalizations due to asthma in the Caddo parish from 2000-2020, available at [Health Data Explorer (la.gov)](https://healthdata.ldh.la.gov/), was utilized for its specific focus on local asthma hospitalizations. This dataset was used under its stated requirements that its data be used for statistical reporting and analysis only, without disclosing the identity of anyone involved in the dataset, and without claiming any interpretations to be the official conclusions of the state of Louisiana.

In order to calculate the AQI in Shreveport, data from the Environmental Protection Agency (EPA)'s Air Quality System (AQS) API was used. The AQS API is a service that provides historical air quality data from monitoring stations across the country and associates each monitoring station with a particular region in their state, available [at the AQS website (epa.gov)](https://aqs.epa.gov/aqsweb/documents/data_api.html#signup). In this dataset, hourly air quality data is measured independently for several key pollutants such as carbon monoxide at each monitoring station and can be aggregated to obtain an estimate of the air quality in any given city.

And in order to calculate the impact of wildfire smoke on Shreveport, data on the incidence, scale, and location of wildfires was obtained from the US Geological Survey's Wildland fire dataset. This dataset combines the data from 40 different fire data sources to provide size, severity, and geographic data for controlled and uncontrolled fires across the United States, enabling us to calculate the propagation of smoke from each individual wildfire into Shreveport. In order to easily make geospatial calculations accounting for the curvature of the Earth at these large scales, the fully cleaned and combined data was obtained in geodatabase format [at the USGS’ ScienceBase Catalog (sciencebase.gov)](https://www.sciencebase.gov/catalog/item/61aa537dd34eb622f699df81).

# 3 - Methodology

To create the asthma hospitalization predictions our analysis needs, four data processing and modelling steps were followed. First, the air quality dataset was aggregated to obtain the daily and yearly average values for peak AQI across all wildfire pollutants. Then, a simple model of smoke propagation was used to estimate the annual impact of fire smoke on Shreveport using the USGS wildfire dataset. With these new datasets, smoke impact on Shreveport was forecasted into the future using an ARIMA time series model. And finally, smoke impact metrics and historical asthma data were used to predict future annual rates of asthma hospitalization.

## 3.1 - Air Quality Estimation

In order to make the most direct comparisons to the smoke impact value possible, our metric of air quality in Shreveport must describe the describe the level of pollution during the fire season with a single overall value. As the AQS API returns data for each individual pollutant over the entire year, this dataset must be filtered and aggregated. To accomplish this, data from outside the fire season was discarded and the highest AQI value across all particulate matter and gaseous pollutants was taken to be proportional to the true level of air pollution across all pollutants, both measured and unmeasured. As each of the four monitoring stations are all within the city of Shreveport, the average AQI estimate reported for each station was taken to be the true air quality for the city of Shreveport as a whole.

This data was then averaged out across each day and across each year to obtain both a daily and a yearly dataset of estimated AQI for the city of Shreveport.

## 3.2 - Smoke Impact Estimation

In order to forecast the future impact of smoke on the city of Shreveport, the wildfire dataset must be used to estimate the impact of smoke on Shreveport from each reported wildfire.

To create an estimate of smoke impacts on Shreveport, we must first develop a rudimentary model for the relationship between smoke impact and nearby wildfires. The model for smoke impact must take into account factors in the dataset that are assumed to affect the severity of smoke on nearby cities. Within the wildland fire dataset these factors are the size of the fire, the distance of the fire from the town, and whether or not the fire was prescribed.

The size, or area, of a fire is taken to be directly proportional to how much smoke it will output as a larger burning surface area is a larger smoke-producing surface area. The distance of a fire from a city is taken to be inversely proportional to how much of its smoke we would expect to be able to reach it, operating under the assumption that smoke propagates through passive diffusion and is thus beholden to the square-cube law.

Additionally, the model will make use of the fact that the wildland fire dataset contains both wildfires and prescribed, controlled fires. While both of these kinds of fires can be expected to generate similar amounts of smoke (controlling for size), it is reasonable to assume that controlled fires are typically performed with the aim of minimizing the impact on large populated areas. As such, it is expected the smoke impact would be proportional to how uncontrolled the fire is. This notion is represented in the wildland fire dataset as an ordinal variable for “wildness”. This column was converted to a numeric format from 1 to 5 for use in estimating smoke impacts.

Following this logic, a rudimentary model was developed where the smoke impact is the product of the fire area, the fire “wildness” value, and the square of the inverse of the distance to the city (calculated while accounting for the curvature of the Earth). Through this, a smoke impact was assigned to fire in the wildland dataset. As a final step, the average annual smoke impact dataset was calculated by multiplying a wildfire’s smoke impact by its duration (to account for longer smoke outputs) and averaging across all wildfire smoke impacts in each year.

## 3.3 - Smoke Impact Forecasting

With the smoke impact and AQI datasets complete, the forecasted values of smoke impact could now be obtained. A brief augmented Dickey-Fuller test was performed to confirm that the AQI and smoke datasets were not wildly non-stationary before moving on to time series modelling.

As the ADF test returned a p-value of 0.07, it is not unreasonable to assume stationary behavior in the dataset, and so an ARIMA time-series forecasting model was employed to forecast the smoke impact out 20 years using the AQI and smoke estimate values as training data.

## 3.4 - Predicting Asthma Hospitalizations

With all the necessary data generated, it was finally possible to train a predictive model to forecast asthma hospitalizations out into the future and determine Shreveport city hall should adjust its budget to match the expected trends in asthma outcomes.

Throughout the development of this analysis, five model types were considered for this prediction. Simple linear regression models, polynomial regression models, random forest models, ARIMA forecasting models, and SARIMAX forecasting models were all trained and compared for their outputs and levels of confidence. However, all models with the exception of simple linear regression produced identical predictions for the future trend in asthma. Given this, polynomial regression was chosen for its simplicity and low training cost to be the model type for predicting asthma hospitalizations.

For the polynomial regression model, the smoke estimate and asthma datasets were combined into a single dataset, the interaction and second order polynomial terms were obtained for all three metrics, and a linear regression model was trained directly on the data. Future years and the forecasted future smoke impacts were then used to obtain the predicted values for asthma hospitalizations in Shreveport, Louisiana.

# 4 - Findings

## 4.1 - Dataset Analysis

Before investigating the predictions generated by the forecasting models, this analysis first inspected the datasets directly to determine the true extent of the wildfire spread in Shreveport and to observe the correlation or lack thereof between smoke impacts and AQI.

### 4.1.1 - Shreveport Fires By Distance

A graph of a fire distance

Description automatically generated

The above plot shows the number of fires occurring as a function of distance from Shreveport for all fires up to 1800 miles away from the city. The x-axis provides the distance in miles from the city of Shreveport, separated into 50 mile segments. The y-axis provides the number of fires in the past 60 years that have occurred at that distance from the city.

Each blue column represents (through y-axis height) the number of fires that have occurred at a distance from the city that falls within the 50 mile distance range that each column takes up along the x-axis. The dashed black line through the left side of the plot denotes the 650 mile mark. This is the cutoff distance that was used to decide what data should be used to train a time series model to predict smoke pollution in Shreveport as a function of time. Only wildfires to the left of the dashed black line were included in the smoke and asthma models’ training datasets.

Looking more closely at this dataset, we can see that it does not quite follow the linear upward trend that we would expect. Given that each bin in the histogram corresponds to a ring around Shreveport and that the area of each ring is a linear function of its distance from Shreveport (its radius) we would expect to see a direct upward linear trend in this plot if fires were distributed completely at random. Instead, we can see remarkably many fires in the 50-300 range and remarkably few fires in the 1000-1350 range. This would suggest that wildfires are more common near Shreveport than they would be through random chance and that the ring 1000-1350 miles out from Shreveport is less prone to wildfires than it would be through random chance.

### 4.1.2 - Annual Wildfire Area Near Shreveport

A graph of a number of years

Description automatically generated

The above plot shows the known number of acres of land burned within 650 miles of Shreveport for each year in the past 60 years. The x-axis indicates the year being considered. The y-axis indicates the area of land (in acres) that burned within 650 miles of Shreveport during that year.

In this plot, high peaks represent a year in which a high amount of area burned within a 650 mile radius of Shreveport while low points represent a year in which Shreveport had little land burned around it within the same space. Points before 1983 that show no absolutely land simply represent the fact that the area of land burned around Shreveport was not well documented before 19836.

Looking at this plot, the astonishingly exponential state of wildfire growth in Shreveport becomes undeniable. While many regions in the United States have experienced a significant increase in wildfires, this trend is typically linear, [as can be seen from the NIFC’s national wildfire area statistics (nifc.gov)](https://www.nifc.gov/fire-information/statistics/wildfires). The exponential rise seen in this plot alongside the previous plot’s high incidence of fires in close proximity to Shreveport suggest that Shreveport is indeed particularly prone to wildfire exposure.

### 4.1.3 - Annual Smoke Impact and AQI in Shreveport

A graph of a graph showing the growth of a number of people

Description automatically generated with medium confidence

The above plot shows the smoke impact score and AQI over time for the city of Shreveport. The x-axis indicates the year being considered. The y-axis on the left of the plot indicates the estimated smoke impact in the city for any given year. And the y-axis on the right of the plot indicates the estimated AQI in the city for any given year.

When both AQI and smoke impact increase between years in tandem, it represents an increase in estimated pollution that occurred alongside an increase in estimated fire smoke. With this in mind, it can be clearly seen that every large increase in AQI coincides with an increase in estimated smoke impact. However, the *inverse* is not always the case. This reasonable when one considers the fact that Shreveport has a large mountain range directly to its west. The model used to generate smoke impact values did not take into account the presence of geographical barriers, and so not all wildfire smoke would actually be able to reach Shreveport and affect its AQI. Thus, after 1985 all dramatic spikes in AQI can be attributed to wildfire smoke that reaches Shreveport.

However, the data before 1985 tells a completely different story. Before 1985, nearly no major known fires occurred. Yet despite this, the AQI was at its all-time high. This is due to the very simple fact that Shreveport used to be home to the highly unregulated operations of General Motors and major oil companies. As in many industrial centers across the United States, the air quality in the region improved once environmental regulation began to be developed.

## 4.2 - Smoke Impact Analysis

A graph showing a blue line and a purple line

Description automatically generated

The above plot shows the estimated smoke impact values generated by the time series model developed in the analysis. Along the x-axis, the plot shows the number of years since 1984.The year “40” in this plot indicates the present day. Along the y-axis, the plot shows the estimated smoke impact level generated by the time series model. This smoke impact level is calculated as a function of the area of all fires within 650 miles of Shreveport divided by the square of their distance to Shreveport, modeling the dispersion of smoke particles via passive diffusion.

The line in black shows the estimated smoke impact values in years for which we currently have data. The blue line shows the expected smoke value for future years, extrapolating the time series model out until 2049. The light-blue area shows the 95% confidence interval for the smoke impact estimates into the future. There is a 95% chance that the light-blue area shown contains the actual future estimate of smoke impact for that year. As can be seen, the time series forecast is highly questionable. The expected forecast trend is completely flat, with the model predicting that all future years will have a smoke impact value within the range of values that have been seen since the year 2000.

Clearly, there is no periodic relationship between AQI and smoke impact in Shreveport. This is understandable, given that Shreveport is a town with major oil and steel industries that contribute a significant amount of the air pollution in the city. While the previous analysis clearly shows that spikes in AQI are associated with spikes in smoke impact, the opposite is not always the case and data from before 1985 shows a complete disconnect. Ultimately, this aspect of the analysis yields the answer that AQI and smoke impact have no meaningful time-series relationship between them in Shreveport.

But for the purposes of this analysis, the question of greatest interest is whether or not smoke impact has any predictable connection to asthma hospitalizations.

## 4.3 - Asthma Prediction Analysis

A graph of a graph showing the growth of asthma

Description automatically generated

In the above plot, the y-axis shows the historic or predicted rate of asthma hospitalizations in terms of hospitalizations per 10,000 people while the x-axis shows the year for which historic data or predicted data is being displayed. The blue line corresponds to well-characterized historic data while the black line corresponds to predicted asthma data.

From this plot, a surprising result can be seen. The predictive model suggests that asthma rates will *decrease* over the coming years despite the noticeable upward trend in wildfires. While this may appear to be erroneous, newly collected data on asthma rates in 2020 show that the observed asthma rate in Shreveport was 4.2 per 10,000 people, even lower than the predictions put out by this model[CITE-DATA SOURCE].

As can be seen earlier, the smoke estimate forecast model did not find any meaningful periodic behavior, which suggests that this prediction was made solely using the trend in asthma hospitalizations over time. It would appear that despite the rise in wildfires around and even *in* Shreveport, the decrease in AQI caused by steadily increasing environmental regulations on the local industry has led to a decrease in asthma complications overall.

# 5 - Discussion

## 5.1 - Asthma Funding

Looking at the above trends in asthma predictions, smoke forecasts, and wildfire incidence rate, a clear picture of the circumstances in Shreveport, Louisiana begins to emerge.

The results of the asthma hospitalization forecast are clear, important, and corroborated by local research. Asthma hospitalizations are expected to decrease despite the rise in wildfires around Shreveport. As industrial emissions continue to decrease throughout the year, the impact of wildfire smoke that only shows itself during fire seasons turns out to be comparatively unimportant despite its strong connection to air quality.

Indeed, while air quality and wildfire smoke appear to show some level of connection when smoke manages to reach the city, the overall trends in both show little-to-no agreement. Over the past 60 years, air quality visibly trends downward while estimated smoke impact visibly trends upward. Indeed, the smoke forecasting model’s completely flat trendline for predicted smoke impacts highlights the lack of both periodic and stationary relationships between air quality and smoke impact in the long term.

With these observations in mind, there is no reason to suggest that Shreveport city hall allocate more funding toward asthma hospitalizations. In fact, there is good reason to suspect that the city could afford to slightly cut funding in this area to focus on other rising threats to the area.

## 5.1 - Fire Prevention Funding

Just as the results of this analysis show that asthma is unlikely to become a more serious issue in the near future of Shreveport due to improved air quality regulations, the results also show that wildfires themselves may be a greater threat to the area than once anticipated.

While the majority of the United States is seeing a linear increase in annual acres burned by wildfires, Shreveport spears to be undergoing an exponential increase in wildfire prevalence. Indeed, while this analysis was being developed local news story emerged about a house that been burned down twice in the span of two weeks.

Shreveport’s flat and unobstructed area relative to its surroundings (caused by the development of oil and steel in the area) appear to have made particularly prone to propagating wildfires out across larger areas. While asthma is unlikely to be exacerbated by wildfires, the fires themselves pose a significant threat to the health and finances of the city.

Seeing as how asthma hospitalizations do not require additional funding to continue improving outcomes in the area, this analysis recommends that city hall dedicate its surplus resources towards researching and addressing the factors in Shreveport that make it so prone to fire damage. From what this analysis has been able to gather, early investigation may be necessary to prevent more large-scale fires like the one seen in 2011. Through sufficient regulatory intervention, it may be possible for wildfire trends to follow the same path as air pollution in Shreveport.

## 5.3 - Reflection

In constructing this analysis, the foremost question driving the project’s structure was the question of “how will these fires exacerbate the concerns of Shreveport’s most disadvantaged groups?”. In a city filled with difficult and dangerous employment, whose economic circumstances are so strained as to have never exceeded its peak population from the 1980s, the poor and the ill are likely to be the most vulnerable groups of all.

Though Shreveport’s formerly unregulated businesses made its citizens prone to many kinds of illness and many forms of exploitation, asthma has been an issue in the city since the days of Standard Oil and United Gas in the mid-1900s. Given the well known presence and vulnerability of this group as well as their susceptibility to smoke pollution, the impact that rising wildfires would have on this group seemed particularly worthy of study.

In particular, the trying economic circumstances of the area made it particularly important to consider the impact that smoke would have on hospitalizations in the area specifically. While many analyses have been done into the effects of various factors in the area on asthma *mortality*, comparatively little material even existed for the topic of hospitalizations, despite the significant financial burden such an event can impose onto a group that already struggles to obtain affordable insurance. For this reason, this project’s analysis was centered specifically on the impacts that smoke could have on asthma hospitalizations, despite the difficulty in obtaining usable data for this purpose. If it turned out that asthma hospitalizations were expected to increase proportionally to the exponentially rising rates of wildfire smoke, the human cost of inaction would be tragic to behold.

# 6 - Limitations

In attempting to forecast the impact of wildfires on Shreveport, this analysis ran into numerous issues at every step of the process. Among the two most significant limitations were the ones inherent to the available data and the nature of the smoke impact estimate.

## 6.1 - Data Limitations

When attempting to find usable data for modelling asthma hospitalizations in the area, this analysis ran into the simple fact that asthma hospitalizations are poorly documented compared to mortality.

As hospitalization is likely to have significant physical and financial implications for anyone following an asthma attack, it was important to this analysis that this data be the focus of the project’s modelling. Asthma mortality data fails to capture the true extent of the burden that poor air quality imposes upon people living with asthma and focuses instead on the extremes at which life-threatening complications can occur. Overall, a poor metric for understanding the real human impact of air quality on the citizens of Shreveport.

However, the only available source for asthma hospitalizations in the area that did not group it under a blanket category of “respiratory illnesses” that included COVID-19 was the in-progress dataset published by the Louisiana Department of Health. This dataset has the significant issue of only covering yearly asthma hospitalization rates and only from the years 2000 – 2020. In addition to this, the data from 2016-2020 is openly stated to be poorly characterized and subject to greater uncertainty both due to the advent of COVID-19 and due to incomplete data collection. As such, the predictive modelling was performed with only the well-characterized data from 2000-2015. This had the potential to limit the forecasting capability of the model significantly, though the direction of its predictions still largely agreed with more recent findings.

## 6.2 - Smoke Impact Limitations

By far the most relevant limitation however, was the implementation of the smoke impact metric. Due to the explicit directions that this analysis received, the spread of wildfire smoke onto Shreveport was estimated directly from the USGS wildland dataset without taking the necessary time to develop a meaningfully accurate model of smoke propagation. The proposed passive diffusion model of smoke impacts is flawed in two fundamental and concerning ways that undermine its ability to predict long-term trends in air quality, as can be seen from the results of the ARIMA smoke impact forecasting model.

The first issue that the model fails to account for is the geography of the region. As briefly discussed in the analysis of annual smoke impacts and AQI in Shreveport, the city has a large mountain range directly to the west of it that is nearly guaranteed to dampen the flow of air toward the city from the west. Indeed, while Shreveport itself may be situated in a relatively flat and unobstructed area, the terrain more than 30 miles away from it is characterized by several mountains and hills that affect air flow in complex and relevant ways. Not accounting for this makes it impossible to factor the direction of fire relative to Shreveport into the smoke impact analysis.

But far more relevant is the second major issue with the smoke estimate model. As any long-time inhabitant of Seattle knows, wildfire smoke does *not* passively diffuse into the surrounding area. The particulate matter within it is so well aerosolized that it will follow the path of the wind, even going so far as to travel two states to the north of where the wildfire originates from to impact Washington state rather than the neighboring state of Nevada, leading to a historic bout of air pollution in the city of Seattle. Not factoring wind direction into the model of smoke propagation makes it completely unusable as a serious measurement of smoke’s impact on any given location. It is only due to Shreveport’s relatively mild weather that this estimate is able to achieve any resemblance to the area’s AQI at all.

# 7 - Conclusion

Over the past 40 years, wildfires have become exponentially more common all across America. And this trend has been felt particularly strongly in Ark-La-Tex’s industrial center: Shreveport, Louisiana. Given the city’s history of high asthma hospitalization due to is oil and steel manufacturing industries, there is a concern that an increase in wildfires will lead to an increase in the asthma hospitalization rates that had only just begun to lower in Shreveport.

In order to help guide the decision making of Shreveport’s hall in the face of this sudden issue, this analysis set out to predict the effect that wildfire smoke would have on asthma hospitalizations in Shreveport. In order to accomplish this, wildfire data from the U.S. Geological survey was used to estimate the impact of smoke from every recorded wildfire near Shreveport on the city. In order to forecast smoke impact out into Shreveport’s future, AQI data was obtained from the EPA’s AQS API and used to train a time series forecast model for future smoke impacts. Using this forecast and asthma hospitalization data from the Louisiana Health Department, a predictive model of asthma hospitalizations in Shreveport was developed.

According to both the predictive model of asthma and recent research performed in Shreveport, asthma hospitalization rates are expected to drastically decrease despite increasing wildfires in part due to reduced pollution form the local steel industry. This decline in local pollution is predicted to exceed the effects of smoke for the next 20 years. As such, there is no pressing need to allocate further funds towards asthma.

However, the incidence of wildfires is increasing at an exponential pace. In order to prevent wildfires from becoming an uncontrollable threat to Shreveport’s populace and economy in the far future, this analysis recommends that municipal funds be allocated towards the research and regulation of the factors that enable wildfires to occur so frequently and spread so rapidly in the area surrounding Shreveport, Louisiana.

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