

Asthma vs. PM_{2.5}: A Bridge Between Health and Environmental Surveillance.

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Objective

To inform asthmatic, health plan patients of air quality conditions in their specific geographic location and to assess if the communication is successful in reducing the number of emergency department visits for asthmatic/respiratory flare ups.

Introduction

Southwest states are prone to wildfires, dust storms, and high winds especially during the monsoon season (June – September). Wildfire smoke is a complex mixture of carbon monoxide, carbon dioxide, water vapor, hydrocarbons, nitrogen, oxides, metals, and particulate matter (PM). Dust storms are made up of aerosols and dust particles varying in size; particles bigger than 10 µm are not breathable, but can damage external organs such as causing skin and eye irritations. Particles smaller than 10 µm are inhalable and often are trapped in the nose, mouth, and upper respiratory tracts, and can cause respiratory disorders such as asthma and pneumonia. Numerous studies have characterized the epidemiological and toxicological impact of exposure to PM in dust or smoke form on human health [1].

All of these environmental conditions can have impacts on cardiovascular conditions such as hypertension and cause respiratory flare ups, especially asthma. Previous studies have shown a relationship between PM exposure and increases in respiratory-related hospital admissions [1-4]. In an analysis of the health effects of a large wildfire in California in 2008, Reid, et. al, observed a linear increase in risk for asthma hospitalizations (RR=1.07, 95% CI= (1.05, 1.10) per 5 µg/m³ increase) and asthma emergency department visits (RR=1.06, 95% CI=(1.05, 1.07) per 5 µg/m³ increase) with increasing PM_{2.5} during wildfires [5]. In a study specific to New Mexico, Resnick, et. al, found that smoke from the Wallow fire in Arizona in 2011 impacted the health of New Mexicans, observing increases in emergency department visits for asthma flare-ups in Santa Fe, Espanola, and Albuquerque residents [6].

This current study will evaluate the effectiveness of outreach to asthmatic members during times of poor air quality; informing them of the air quality, instructing them to limit their outdoor activity, and to remind them to carry or access their inhalers or other medical necessities if/when needed.

Methods

A recent 12-month eligible member list was generated including member ID, street address, zip code, and a count of the number of emergency department (ED) visits for the specified time period. The member list was then geocoded using the tool Quest. Any records that did not map to a latitude and longitude within the state boundary of New Mexico were excluded. The geocoded list was then joined to a list of members who had an indicator for asthma (a hospital admission or ED visit with a primary diagnosis for asthma). This list of asthmatic, eligible members was then mapped using QGIS 3.2.

The New Mexico Environment Department's (NMED) air quality bureau operates a network of ambient air monitors across the state. Monitors range in size from neighborhood level to regional and pollutants measured include ozone, PM_{2.5}, PM₁₀, Nitrogen Dioxide, and Sulfur Dioxide. Each individual air monitor was mapped to a point location with individual buffer zones (dependent on the monitor's collection size).

Asthmatic members were mapped to air monitor buffers using a spatial overlap program in QGIS. Each air monitor then had a list of asthmatic members who were tied to the air monitor and would be contacted if the air quality index (AQI) value for that air monitor was less than good (>50).



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Results

In a given 12-month period, there were 38,364 asthmatic members mapped to a geographic point within the state boundary of New Mexico. Of the 14 air monitors across the state, 9,965 (26%) asthmatic members mapped to an air monitor. NMED posts air monitor readings on their website daily. During the upcoming 2019 monsoon season, air monitors with a daily AQI reading of >50 will trigger the emailing of a scripted letter to asthmatic members (connected to that specific monitor) informing them of poor air quality in their area and alerting them to limit their outdoor time and to ensure that their medications are up-to-date and easily available. In order to construct this letter in a non-intrusive, succinct manner, collaboration with business partners (who have experience with working with members on a 1:1 basis) within the organization will assist with ensuring a targeted message.

After the 2019 monsoon season, this project will be evaluated to determine if the intervention was beneficial in reducing the number of ED visits for the members who were contacted. ED visit rates specific to asthma (inclusion of asthma specific diagnosis code) will be compared for the pre and post intervention monsoon seasons.

Conclusions

Combining external, state-level data with internal member-level data can have powerful results. Due to protected health information (PHI), state level data sometimes is unavailable at a person-level basis, and thus pointed, individual interventions are not possible. By combining internal and external data sources on different health related topics, it is possible to create a more cohesive, person-level, health-impactful view of a person and their environment.

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