***Article***

***Exploring the cause and effect of Air Pollution: A Visual approach***

**Abstract:** The research studies the correlation between relative features and deaths due to ambient air pollution. Ambient Air pollution can be defined as the emission of harmful substances to the atmosphere. The major components of harmful substances can be particulate matters and pollutants like SO2, NOx,CO, VOC, etc. This research applies abundant visualization to show the correlations between different features and the air quality of a number of countries. The 2005 WHO Air quality guidelines offered global guidance on thresholds about key air pollutants that lead to higher health risks. To decrease the mortality due to air pollution (especially for PM 2.5) , our research decides to figure out attributes that have relatively strong influence on it. We develop mechanisms to rank the impacts of different attributes on death rate due to PM2.5 and make policy based on each important points.

The Guidelines indicate that by reducing particulate matter (PM10) pollution from 70 to 20 micrograms per cubic metre (μg/m), we can cut air pollution-related deaths by around 15%.

**1. Introduction:**

With rapid consumption of non-renewable sources and inappropriate air pollution treatment, the negative impacts brought by decreasing air quality becomes more and more remarkable nowadays. Air pollution includes both gases and solid particles in the air. This broad definition therefore encapsulates a number of pollutants, such as sulphur dioxide (SO2),nitrogen oxides (NOx),ozone (O3),particulate matter (small suspended particles of varying sizes),carbon monoxide (CO), volatile organic compounds (VOCs) and so forth.

Among all air pollutants, particulate matter has a serious negative influence on respiratory health. Car emissions, chemicals from factories, dust, pollen and mold spores may be suspended as particles. Particulate matter (PM) is mainly classified with size and chemical components. According to their aerodynamic diameters, PM is divided into coarse (≤ 10 μm and >2.5 μm; PM10), fine (≤ 2.5 μm and >0.1 μm; PM2.5) and ultrafine (≤ 0.1 μm; PM0.1) particles [6]. PM2.5 and PM0.1 can escape from these barriers and directly enter the lower airways through breathing, and even penetrate into the circulation system through lung gasblood exchange regions and cause damage to the entire body [10]. Thus, approximately 60% and 20% of total PM depositions in the lung are found to be ultra fine or fine particles, respectively [6]. Moreover, PM2.5 makes up 96% of particles retained in the lung parenchyma [11]. Thus, PM2.5 and PM0.1 have more destructive effects on the lung.

However, the mortality due to fine particulate matter (PM2.5) should receive far more attention. Under age 15, more than 90% of children in the world live in excessive amount of ambient fine particulate matter (PM2.5), comparing with WHO air quality guidelines. Among those children, 630 million of children are under 5 years of age, and 1.8 billion of children are under 15 years **(citation)**.

This report is structured as follows: In section 2, we propose our research questions. In section 3, we explain our methodology comparing air quality of different countries and extracting most relevant factors.

**Hypothesis Development:**

**Methodology:** A visual approach has been carried out to analyze and interpret the data to come out with useful **.** The discipline of visual analytics aims to provide researchers and policymakers with better and more effective ways to understand and analyze large data sets, while also enabling them to act upon their findings in real time. Visual analytics integrates the analytic capabilities of the computer and the abilities of human analysts, thus inviting novel discoveries and empowering individuals to take control of the analytical process. It sheds light on unexpected and hidden insights, which may lead to beneficial and profitable innovation [[27](#30j0zll),[28](#1fob9te)]. Driving visual analytics is the aim of turning information overload into opportunity; just as information visualization has changed our view on databases, the goal of visual analytics is to make our way of processing data and information transparent and accessible for analytic discourse.

**Results:**



















