| Study                                                                 | Reference                                  | Pollutant Streams Measured | Sampling Location | Data Sampling Method |
|----------------------------------------------------------------------|--------------------------------------------|---------------------------|------------------|---------------------|
| Atmoisome: A Comprehensive Approach to Understanding the Personal Atmospheric Exposome | AMS - Current Study [42]                   | PM$_{10}$, PM$_{2.5}$, CO, CO$_2$, NO$_2$, NOx, O$_3$, LPG, NG, eCO$_2$, H$_2$, NH$_3$, H$_2$S, CH$_4$, alcohol, formaldehyde, aromatic compounds, ambient parameters | 4 different domestic locations in 2 different countries were sampled | Cluster sampling   |
| Indoor air quality in two French hospitals: Measurement of chemical and microbiological contaminants | [43]                                      | VOCs, PM$_{10}$, PM$_{2.5}$, ambient temperature parameters, virus, bacteria, fungi | Two French hospitals were sampled in seven healthcare departments in different seasons | Cluster sampling   |
| Volatile Organic Compounds (VOCs) in Conventional and High-Performance School Buildings in the U.S. | Characterization of Indoor Air Quality on a College Campus: A Pilot Study [44] | Various types of VOCs | 144 classrooms in 37 conventional and high-performance elementary schools were sampled | Stratified sampling |
| Personal Exposure to Mixtures of Volatile Organic Compounds: Modeling and Further Analysis of the RIOPA Data | Indoor Air Quality in Green-renovated vs. Non-Green Low- Income Homes of Children Living in a Temperate Region of US (Ohio) [45] | Various types of VOCs | Three building types were sampled for a year | Convenience sampling |
| Indoor Air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Indoor Air Quality from the 2017 Gulf Cooperation Council summit [46] | PM$_{2.5}$, black carbon, sulfur, VOCs, formaldehyde | 300 households in 3 cities in the US were sampled | Convenience sampling |
| Non-ventilated rooms, commute cars, airplanes, kitchens, closed areas with cleaning services | Household materials, kitchen activities, crowds [47] | PM$_{2.5}$, PM$_{10}$, VOCs, CO, CO$_2$, SO$_2$, NO$_2$, heavy metals | Childrens’ sleeping rooms in 800 apartments in a low-income multi-family housing complex were sampled | Convenience sampling |
| Low-cost sensors connected via microcontroller, processed in cloud | Detection Techniques [48]                  | Electrochemically active analyzer, automated thermal desorber, gas chromatography, mass spectrometer | Gas Chromatography, Mass Spectrometry and passive samplers | Web of Science, PubMed, Google search, WHO database were used to conduct the meta-analysis |
| Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Data Sampling Location [49]                 | GK2.05 (KTL) aluminum cyclones, SKC button samplers and sampling pumps, TSI Q-trak, passive badges | HOB0 logger, PTFE, membrane filters, PFC(polyfluoro carbon) technique for airflow rate | Data Sampling Method [50] |
| Non-ventilated rooms, commute cars, airplanes, kitchens, closed areas with cleaning services | Pollutant Streams Measured [51]            | Products, health care activities, and building activities used indoors in hospitals | Classrooms in recently renovated conventional and high-performance elementary schools | Indoor air quality and exposure assessment of the gulf cooperation council countries: A critical review |
| Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Sampling Location [52]                     | LEED certified, retrofitted, and conventional building types on a college campus | Vehicles, building materials, cleaning products, adhesives, repellents, chlorination | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review |
| Detection Techniques [53] | Indoor Air Quality from the 2017 Gulf Cooperation Council summit [54] | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Green (protected with sealants) and non-green homes in low-income housing complexes | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review |
| Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Data Sampling Method [55]                  | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Household materials, kitchen activities, crowds | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review |
| Indoor Air Quality from the 2017 Gulf Cooperation Council summit [56] | Indoor Air Quality from the 2017 Gulf Cooperation Council summit [57] | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review | Indoor air pollution and exposure assessment of the gulf cooperation council countries: A critical review |
Data Sampling Duration

Continuous year-long data collection in US and India; ongoing collection in US
1 summer and 1 winter campaign, twice over 4 consecutive days
22 weeks of data collection efforts
6 sampling campaigns, each 48 hours, across 3 seasons
Sampled 2 times, 3 months apart
Measured over a five-day period, recording every five minutes
Data gathered from multiple papers

Statistical Analysis

Numerical and Time Series analysis & scatter plot and histogram analysis
Non-parametric tests with Bonferroni correction
One-way ANOVA and Kruskal Wallis (K-W) tests
Geometric means, standard deviation, log transformation, Fisher’s Least Significant Difference
Extreme value distributions and mixture models
Linear mixed-effects models
Correlation analysis

Public Health Implication

Provides access to individual air quality data to analyze personal, geographical and demographical patterns
Air filtration in hospitals keeps them less polluted than regular indoor spaces
Additional research is needed to link EQ and energy to health and performance in “green” buildings
Classrooms had more PM$_{2.5}$ than common areas, and green buildings had more pollution than conventional buildings
Exposure to VOCs is a large contributor to health issues across the body and diseases
It is important to further evaluate new, green and eco-friendly housing
Applying highly efficient particulate air filters is an urgent solution to reduce the emission of indoor PMs

Table 1. Summary of recent AQI studies as compared to the study presented in this work