# Exposure Assessment of Biomass Burning

## A SCOPING REVIEW ON CURRENT AND EMERGING APPROACHES

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**Biomass burning** is the **main source of air pollution** in many countries and has been strongly linked to **many morbid and mortal health outcomes.**[1]

**4.2 Million** premature deaths were attributed to ambient outdoor air pollution in 2019.[2]

**89%** of these coming from the Southeast Asia and Western Pacific regions.[2]

Air pollution modeling has emerged as an indispensable tool in predicting and estimating public health outcomes attributable to biomass burning, especially with emerging climate trends.[3,4]

This scoping review aims to **explore the current and emerging approaches** for assessing exposure to biomass burning and their advantages and disadvangates in establishing associations to public health outcomes across different counrties.

## METHODS

### Document Review

- A literature search was conducted through PubMed of studies that linked air pollution, biomass burning, and modeling.
- Included studies that explored the public health impacts (long- and short-term), through atmospheric modeling methods.
- Excluded: systematic reviews, guidelines, perspectives, other scoping reviews)

### Article selection process following PRISMA

- 197 papers were initially identified
- Excluded 5 duplicates
- Excluded 42 papers by title screening
- Excluded 72 papers by abstract screening
- Excluded 21 papers by abstract assessment
- **Final: 57 studies included in the review**

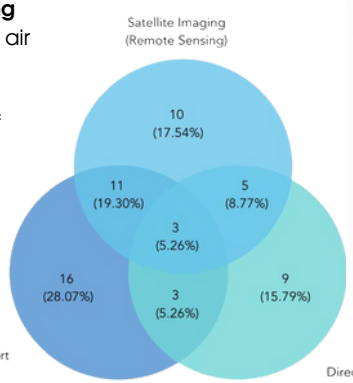
## RESULTS & DISCUSSION

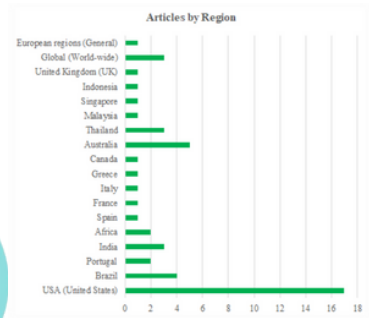
Broadly categorized, the **three main methods of quantifying and collecting air quality data** are through direct site/station monitors, satellite data and air quality models (i.e., CTMs), each with its own strengths and weaknesses. These models offer the capacity to delineate the dispersion of pollutants, assess exposure levels and project the spatial and temporal distribution of health impacts.

**56.14%** Single approach **43.86%** Blended approach

In our findings, **the use of combinations or blended approaches have been the prevailing method for collecting air pollution data.**

**75.44%** Global North focus **25.56%** Pacific (Southeast Asia)




Most modeling methods were developed for the primary purpose of **surveillance** and **not necessarily directly considered for policy development or public health programming.**

The bulk of existing literature **uses air pollution modeling methods calibrated for the global north**, leaving behind the global south. Certain data collection methods may be impractical for many regions, but alternative and free methods are available through the use of NASA's satellite imaging as well as through simulations, as seen in CTMs.

| | Advantages | Disadvantages |
|---|---|---|
| **Station Monitoring** | Gold standard, as it directly measures highly accurate data at a more local level, allowing for long-term and reliable data for air quality. | Limited by the number and placement of the stations, as well as the quality of the measuring devices themselves. |
| **Chemical Transport Model** | Aggregate data from various sources such as satellite measurements and ground-based observations into their simulations, providing a potentially more holistic picture of multiple datasets. | Require significantly intensive computational demands, especially when running at high spatial and temporal resolutions |
| **Satellite-data-based Modeling** | Provides a wealth of information on a regional to global scale. Spatially consistent and may have high temporal resolution and data coverage, complementing the spatial gaps in traditional surface monitor networks. | Satellite sensor sensitivity may vary. There may also be a lack of surface-level information and individual-level information. |
| **Blended Models** | May significantly enhance the accuracy and reliability of the data collected | If machine-learning is used, it would likely require even more computational power than CTMs alone. |

## RECOMMENDATIONS

These approaches would benefit from qualitative and ad hoc assessments to grasp their limitations and the complexity of their results, especially when used to make generalizations for real-life scenarios that could potentially impact public health policy later on.

Recalibration or validation of these models is needed to increase the reliability of the results for the global south.

These should be leveraged to create early warning systems that can communicate risks in a timely manner, especially in the global south, where monitoring stations are fewer and further in between.

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