CHAPTER 2

LITERATURE REVIEW

2.1 Air Pollution in Indonesia

Indonesia experiences the challenge of air pollution through the current problem of rapid urbanization, industrial products, and car emissions. This paper has found that major cities like Jakarta, Surabaya, and Bandung show themselves as having high PM2. 5 and PM10, NOx, SO2, and VOCs. They are produced from different activities such as use of automobiles and other transports, industries, and even homes.

The consequences of air pollution in the health sector of Indonesia are alarming since respiratory and cardiovascular diseases are on the rise in the country's urban dwellers (Firdaus et al. , 2019; Nugraha & Lazuardi, 2020). However, studies such as these can only spark stronger demand for more extensive research in which the results of air quality and medical reports can be combined and analysed. In this regard, this study seeks to address this research question: What are the health effects of air pollution in the major urban areas of Indonesia?

Indonesia's policy reactions to air pollution are diverse, which reveals that efforts aimed at enhancing air quality have been twentieth by inadequate resources and other engagements. Some emerging measures including an enhanced emission limit and encouragement of the use of public transport have been reported to offer some improvement (Ministry of Environment and Forestry, 2021). But focused approaches are required to mitigate such health effects associated with air pollution more in urban environments.

2.2 Public Health in Indonesia Urban Area

The accessibility of public health within Indonesia's urban environment depends on environmental factors, social background, and healthcare. Despite the advancement in the accessibility of healthcare facilities due to urbanization, there are also new forms of diseases connected with environmental pollution, modification in the lifestyle (World Bank, 2020).

Pulmonary diseases and allergies for example asthma, chronic obstructive pulmonary disease (COPD) and other chest disease related ailments are common in the urban dwellers particularly due to air pollution (Dherani et al. , 2008; Utami et al. , 2019). Cancer, and heart diseases including heart attack and stroke are also increasing and research has associated the diseases to pollutants including PM2.5 and NOx. Health problems mentioned above should be solved with the cooperation of workers of different specializations and taking into consideration environmental and social factors.

Even though records show air pollution has a severe impact on people's health there is minimal consideration of environmental health in health planning in Indonesia. The purpose of this study is to raise attention to air pollution as an essential predictor of health and to present prudent suggestions for the integration of environmental health into public health practice.

2.3 Descriptive Epidemiology

Descriptive epidemiology on the other refers to the identification of the distribution and the factors associated with health-related events or conditions in identified populations. It offers a conceptual map focusing on the occurrence of diseases and components affecting occurrences (Last, 2019). Therefore, in the context of this study, descriptive epidemiological approach will be employed in order to examine the geographical and temporal trends in air pollution as well as its concomitant health effects in urban Indonesia.

Prior research on air pollution and health effects incorporated descriptive epidemiology to analyze the difference of the pollutant concentrations and effect across season and region

(Samoli et al. , 2020). Using descriptive epidemiology approach, this study will be useful in establishing the current situation regarding air pollution and its effects on the health of Indonesians in its major cities and coming up with policies that may be adopted to counter the menace.

Descriptive epidemiology will also be useful in this study in determining vulnerable populations and geographical locations with high health risks for intervention to curb the exposure and the effects. This will go a long way in painting a clear picture of the relationship between air pollutants and health hence aiding the formulation of effective public policies.

2.4 Predictive Modeling

In predictive modeling, statistical and machine learning approaches are employed to analyze the patterns in historical data and create estimates for the future. However, as far as air pollution and public health are concerned, the use of correlation and coefficient analysis can be applied to predict the next pollutant levels and its effects on public health under various conditions (Shaddick et al., 2021).

In the past, there has been a formulation of different predictive models, which have been designed to indicate levels of air pollution, and such models consist of deterministic models, which are based on physical and chemical processes and the stochastic models whereby the information that has been collected in the past to identify patterns or trends is used consistently (Carslaw & Ropkins, 2020). Neural networks along with support vector machines have also been used to advance the quality of the forecasts (Hossain et al., 2020).

This research will therefore generate and test outcome prediction models to estimate air quality and related health impacts in Indonesia's urban centers in the future. The models will be derived from big data such as air quality index, meteorology, and health history records. Consequently, false information relevant to the study will only hinder a timely accurate prediction, which when available will allow the implementation of appropriate policies as a measure to prevent exposure and its health consequences.

2.5 Integrated Approach

The comprehensive strategies of analysing the air pollution and the health risks include the use of several fields of knowledge and data sources. It is for this reason that these approaches acknowledge that air pollution as a problem is multifaceted both in its sources and pathways, and also in the ways and extent to which it affects human health given the various environmental, social and economic factors that define people's lives (Briggs, 2019).

Data integration has also been applied in earlier studies regarding the effects of AP on health applying data from AQMS, health, and meteorological models (Gulliver and Briggs, 2019). For this reason, for quantitative data, by combining these datasets, researchers are able to establish relationships that are not discerned when each factor is considered separately.

The research methodology of this study will be multi-disciplinary with the aim of achieving the research objectives of assessing the effects of air pollution on people's health in Indonesian cities. Thus, using descriptive epidemiology, predictive epidemiology and policy research the study will warm accurate understanding of air pollution and relevant health implications and contribute to the production of effective prevention measures.

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