

Bivariate Spatial Pattern Based on The Characteristics of Women Smokers in Indonesia

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ARTICLE INFO	ABSTRACT
ORCHID ID Author 1: - Author 2: - Author 3: - Author 4: -	The increasing prevalence of smoking among women globally has become a critical public health issue. World Health Organization (WHO) data shows 20 percent of women use tobacco. Women smokers face an increased risk of various diseases. Spatial studies need to be conducted as a basis for planning and providing targeted interventions to reduce the spread of diseases caused by smoking. The study aimed to determine the spatial description of smoking among women in Indonesia. This study analyzed the 2017 IDHS data and used an ecological study design with a descriptive approach and a spatial analysis model. The results are Papua was the province with the highest percentage of women smoking with no education and with the lowest de jure wealth quintile. Provinces using the Internet almost daily were Banten and East Java, and the province with women unemployed in the past 12 months before the survey was North Sulawesi. Based on the results, there are five provinces in Indonesia with a high percentage of smoking among women, assessed by education, internet access, wealth quintile, and non-working women. This study concludes that there is a need to implement smoke-free zones (SFZs), also conduct communication, information, and education (IEC) through mass media.
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1. Introduction

Smoking remains a prominent preventable cause of premature mortality and morbidity worldwide, with an estimated six million deaths attributed to it annually (Liu et al., 2017). According to a report by the World Health Organization (WHO), tobacco usage affects a staggering 1.4 billion individuals globally, wherein women constitute approximately 20% of the over one billion tobacco users (World Health Organization. Regional Office for Europe, 2020). The escalating prevalence of smoking among women globally has become a critical public health concern. Women smokers face an elevated risk of various diseases, encompassing cervical cancer, osteoporosis, cardiovascular and respiratory ailments, atherosclerosis, type 2 diabetes, lung cancer, premature menopause, premature birth, fetal growth abnormalities, low birth weight, miscarriage, and increased fetal mortality (Jafari et al., 2021).

The Global Adult Tobacco Survey (GATS) conducted in 2021 by the Ministry of Health (Kementerian Kesehatan) revealed that women aged 15 years and above who smoke stood at 2.7% as per GATS. In contrast, the Basic Health Research Survey (Riskesdas) 2013 reported a smoking prevalence of 2.1% among women. The Ministry of Health noted a surge in smoking promotions across social media platforms, electronic mediums, and other promotional outlets. Notably, the internet medium witnessed an exponential tenfold increase from 2011 (1.9%) to 2021 (21.4%) (GATS, 2021).

One of the reasons contributing to the high smoking rates among women is the intense promotional efforts by cigarette companies, both in high and low-income countries. Notably, the promotion of smoking continues in low-income countries where women's smoking rates remain relatively low. These companies have adeptly reshaped the cultural significance of women's smoking in society, systematically dismantling cultural barriers and amplifying social pressures to foster increased smoking rates among women (Greaves, 2015). In addition, a study revealed that women show a higher susceptibility to addictive properties, making them more vulnerable to cigarette addiction (Le Foll et al., 2022).

Moreover, numerous studies have demonstrated that women encounter more significant challenges in quitting smoking than men, as they are more prone to experiencing heightened anxiety, stress, depression, loss of weight control, and adverse withdrawal effects upon cessation (Alkan & Demir, 2020). Another study also shows that the evidence indicates familial and peer influences significantly impact smoking rates among men and women. Factors such as peer pressure, curiosity, and the absence of effective stress-reducing alternatives influence the initiation and continuation of smoking among women (Salvi & Nagarkar, 2018), (Wium & Wold, 2009).

Based on the data, efforts are required to reduce the use of cigarettes by women. In this case, spatial studies on the characteristics of female smokers are important. This system can bridge and provide a spatial overview by providing area-based information. Hopefully, interventions can be targeted. The results of this study are expected to be useful for policymakers to determine priorities and effective and efficient steps in efforts to reduce the number of female smokers in Indonesia by identifying high-risk areas through mapping to inform public health strategies, encourage evidence-based policymaking, and contribute to global efforts to reduce smoking rates among women.

2. Method

This research used cross-sectional data from the 2017 Indonesia Demographic and Health Survey (2017 IDHS). This nationally representative survey collects demographic and health indicators on individual and household level information. The survey data are publicly available and accessible on the DHS website (www.dhsprogram.com). This research utilized an ecological study design with a descriptive approach and spatial analysis model. The ecological study used maps to see the picture of smoking women in Indonesia. The study population of this study's unit of analysis (sample) is the population, namely all women aged 15 - 49 years in Indonesia. In the interviewed households, 50,730 women were identified as eligible for individual interviews, and from these, completed interviews were conducted with 49,627 women. This study used bivariate analyses on women smoking (% of women smoking cigarettes every day or some days) by the following variables: Education (percent of women with no education or respondents never attended school), employment (percent of women

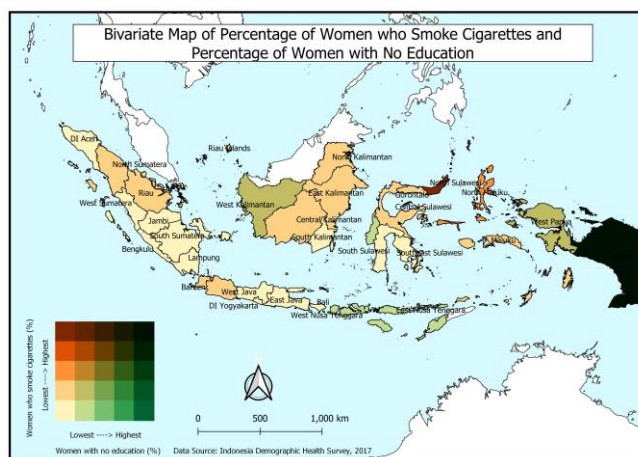
unemployed within the past 12 months before the survey), internet use (percent of women using the Internet almost every day of those using the Internet in the past 12 months), and wealth quintiles (percent of the de jure population in the lowest wealth quintile). The statistical analysis used is a Quantum Geographic Information System (QGIS) performed to organize data in a GIS project for mapping and spatial visualization through vector and raster layers stored in GIS.

3. Result and Discussion

The findings of this study underscore the significant regional disparities in women's smoking prevalence across different provinces in Indonesia. Analysis revealed that Papua Province boasts the lowest prevalence of women smoking, whereas West Java Province recorded the highest prevalence.

3.1 Education

Based on the image analysis results above from 38 provinces, the province with the highest percentage of women smoking with no education was Papua, which is black. The second places were West Kalimantan and West Papua. The province with the highest percentage of tobacco smoking with no-education women was North Sulawesi, shown in maroon, while the second was North Maluku, shown in orange. The third position was Maluku, followed by Central Sulawesi, Gorontalo, South Kalimantan, Central Kalimantan, East Kalimantan, North Kalimantan, Banten, Riau, and North Sumatra, shown in light brown. The provinces with the smallest percentage of uneducated women smokers are Aceh, West Sumatra, Jambi, Bengkulu, South Sumatra, Lampung, West Java, East Java, Bali, South Kalimantan, and South East Sulawesi are shown in cream color. Figure 1 is a bivariate map of the percentage of women smoking and women with no education.



Source: Indonesia Demographic Health Survey, 2017

Figure 1. Bivariate Map of Percentage of Women who Smoke Cigarettes and Percentages of Women with No Education

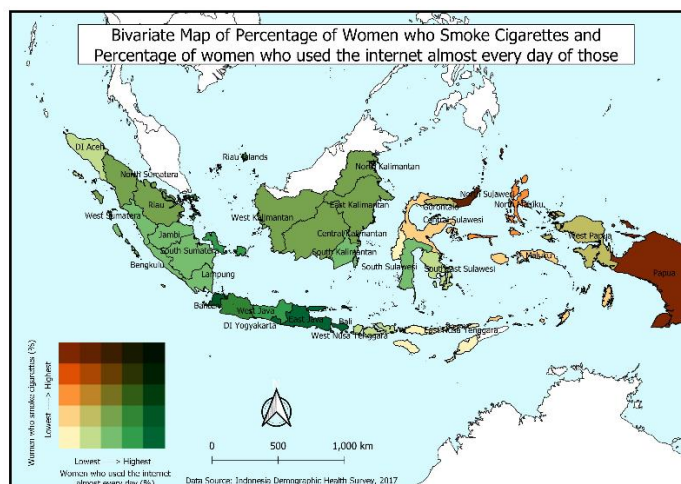
Furthermore, based on Indonesia's national data, the average length of schooling is the lowest in Papua Province at 6.96 years and the highest in DKI Jakarta Province at 11.17 years (World Health Organization. Regional Office for Europe, 2020). Differences in residential areas were also associated with provinces' average length of schooling. Almost all provinces

have achieved nine years of primary education in urban areas for both women and male residents. It differs in rural areas where no province has achieved nine years of primary education for women residents. Papua has the lowest average length of schooling for women 15 years and over, which is 5.97 years or only attending school up to grade 5 elementary school/equivalent (Badan Pusat Statistik dan Kementerian Pemberdayaan Perempuan dan Perlindungan Anak, 2019).

A study on education and smoking found that uneducated people are more at risk for smoking than educated people (Chhabra et al., 2021). Highly educated individuals tend to have more health literacy, live longer, experience better health outcomes, practice health promotion behaviors, and get timely health screenings (Raghupathi & Raghupathi, 2020), (World Health Organization, 2017). Education allows humans to develop a variety of skills and traits (including cognitive and problem-solving abilities, learned effectiveness, and personal control) that predispose them towards better health outcomes, in which case educated people are more likely to think about the impact of cigarette use on their health, in contrast to uneducated people, they do not know the effect that occurs in his health (Raghupathi & Raghupathi, 2020). This study's results correlate with the arguments and data described above, where Papua was one of the provinces with low education. Some studies have stated that uneducated individuals are at greater risk for smoking than educated people (Cahyaningsih & Fitriady, 2019), (Rothman, 2007).

3.2 Internet

Based on the image analysis results above from 38 provinces in Indonesia. The provinces with the highest percentage of women smoking and using the Internet almost daily were Banten and East Java, shown in dark green; the second place in green was West Java province. The third position was the provinces of North Sumatra, Riau, West Sumatra, West Kalimantan, North Kalimantan, East Kalimantan, and Central Kalimantan. In addition, the provinces with the highest percentage of women smokers with low internet use were Papua and North Sulawesi, which are shown in maroon color. In the second place, there was North Maluku, shown in orange. The province with the lowest percentage of women smokers and the lowest internet use was East Nusa Tenggara. Figure 2 shows the percentage of women smokers and women using the Internet almost daily.



Source: Indonesia Demographic Health Survey, 2017

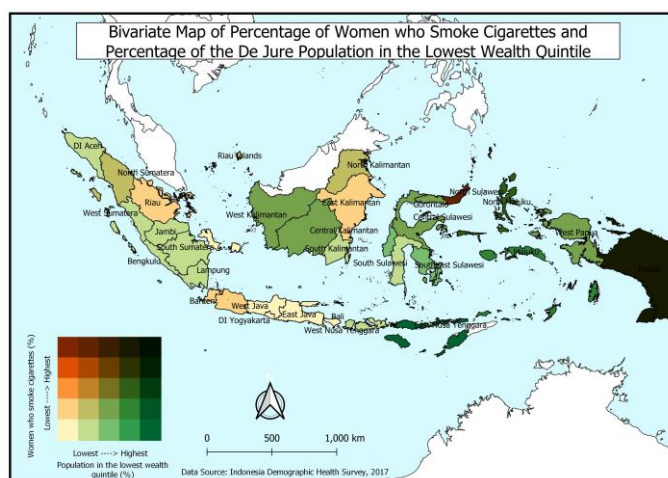
Figure 2. Bivariate Map of Percentage of Women who Smoke Cigarettes and Percentages of Women who Used the Internet Almost every day of those

Based on the analysis above, it was found that the provinces with the highest percentage of women smoking and using the Internet almost every day were Banten and East Java. This fact is reinforced by the results of a survey conducted by the Ministry of Health, which stated that the prevalence of smoking in East Java Province in 2018 increased by 0.2% from 2013, namely by 28.11% in 2018 and 28.90% in 2013 (Kemenkes RI, 2019). Provinsi Banten was one of the provinces that ranks in the top 10 with the highest number of smokers in Indonesia, with a % prevalence of smokers aged ≥ 10 years 26.0% (Mansbridge, 1998). Research states that the Internet is a risk factor that results in cigarette consumption in women, but the numbers are smaller than in men (Su et al., 2019). This is because socio-culture can also be a factor that limits women from accessing and using the Internet. Based on a survey conducted by Kominfo, the highest distribution of internet users in Indonesia was on the island of Java in 2017, with a percentage of 58.08%. The percentage of women internet users in Indonesia was 48.57% (APPJII, 2022).

A study states that access to information through mass media is essential for increasing knowledge and awareness of the environment and influencing people's attitudes and behavior (Scheufele & Krause, 2019). Health information should be accessible to everyone. Information can be accessed through the Internet. Exposure to advertising/ promotional media through the Internet can be at higher risk of influencing someone's behavior, including smoking (Clendennen et al., 2020). The statement in the study is in line with the findings of this study, which states that the percentage of cigarette users in Banten and East Java Provinces is high, this is followed by daily internet use, where a study states that the frequency of internet use affects the incidence of smoking, the exposure to advertising can make someone interested and want to try it (Hansen et al., 2018).

3.3 Wealth quintile

Based on the image analysis results above from 38 provinces, the province with the highest percentage of women smoking with the lowest de jure wealth population quintile was Papua, which was shown in black. Second place was East Nusa Tenggara Province. The third place was North Maluku Province, followed by Maluku as the fourth. In contrast, the province with the highest percentage of smoking tobacco with a de jure low-wealth population quintile was North Sulawesi Province, shown in maroon, followed by Riau, Banten, and East Kalimantan Provinces. Lastly, the provinces with the lowest percentage of smoking tobacco with a low wealth de jure population quintile were East Java and DI Yogyakarta. Figure 3 is a bivariate map of women smoking cigarettes and the percentage of the de jure population in the lowest wealth quintile.



Source: Indonesia Demographic Health Survey, 2017

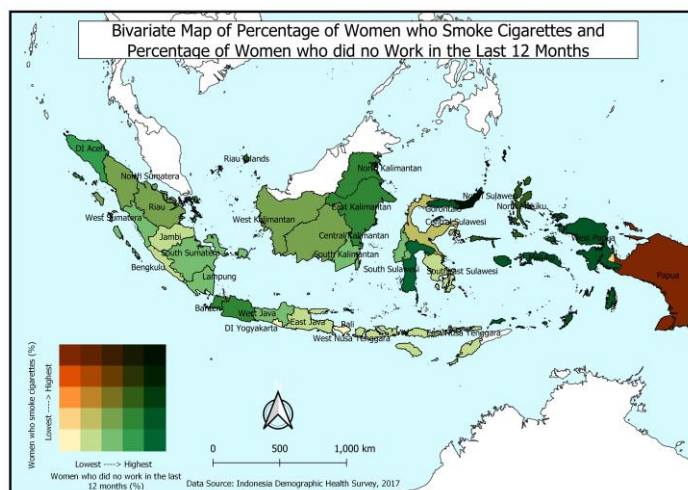
Figure 3. Bivariate Map of Percentage of Women who Smoke Cigarettes and Percentages of the De Jure Population in the Lowest Wealth Quintile

In 2020, the lowest poverty percentage was in Bali Province at 4.45%, while the highest was in Papua, which reached 26.80% (Beyer et al., 2006). In line with the results of this study, Papua Province has the lowest wealth quintile, while Bali was included in the high wealth quintile. A smoking study found a positive relationship between personal income and smoking in adults, where adults tend to smoke at lower income levels (Perelman et al., 2017). Another survey stated that spending money daily was significantly associated with low-income levels; low-income people tend to spend more on cigarettes than high-income people (Chen et al., 2019). In this regard, it can be concluded that Papua is one of the provinces with the lowest wealth quintile and is significantly associated with the high number of women smokers; based on previous studies, people with low incomes tend to spend more on cigarettes.

3.4 Women who did not work

The province with the highest percentage of women smoking, with a percentage of women who did not work in the last 12 months, was North Sulawesi, shown in black. The second place with dark green was West Papua, Maluku, South Sulawesi, and Gorontalo

Provinces. The third place was in North Kalimantan Province, shown in green, East Kalimantan, Banten, and DI Aceh. The province with the highest percentage of tobacco smoking, with a percentage of women who did not work in 12 months, is Papua Province, shown in maroon color, and the province with the lowest percentage of women smokers and not working in the last 12 months was on the island of Bali. Figure 4 shows the percentage of smoking and smoking women who have not worked in the past 12 months.



Source: Indonesia Demographic Health Survey, 2017

Figure 4. Bivariate Map of Percentage of Women who Smoke Cigarettes and Percentages of Women who Did No Work in the Last 12 Months

According to data from the Ministry of Women's Empowerment and Child Protection and the Central Bureau of Statistics, the women's literacy rate in North Sulawesi Province is the highest compared to other provinces 99.2% of women aged 15 years and over in North Sulawesi Province are literate. However, the open unemployment rate among people aged 15 years and over in women in North Sulawesi Province is 8.66%. This figure is higher than that of other provinces (Badan Pusat Statistik dan Kementerian Pemberdayaan Perempuan dan Perlindungan Anak, 2019). The data has a significant correlation with the results of this study, where North Sulawesi Province became one of the provinces with the highest smoking rate with women not working for the last 12 months.

A study showed that the highest use of smoking daily occurs among unemployed people. It can be because unemployed people have a lot of time to smoke and have high stress levels, so they vent on cigarette use (Chen et al., 2019). Other survey results stated that 33% reported poor mental health, and 41% reported poor general health (Herber et al., 2019). Concerning the results of this study, this research concludes that the unemployed have a high risk of smoking. This is reflected in North Sulawesi Province, which has the highest percentage of unemployed women smokers.

In summary, this study offers valuable insights into the prevalence of women smoking in Indonesia. The findings highlight the presence of regional disparities and underscore the necessity for targeted interventions in high-risk areas. To effectively combat smoking rates among women, endeavors should encompass socioeconomic considerations, regional

variations, and the formidable influence of advertising and peer pressure. By comprehensively comprehending the multifaceted factors associated with women's smoking habits, policymakers and public health authorities can devise evidence-based strategies to mitigate smoking rates and enhance overall public health.

4. Conclusion

The results of this study indicate that the province with the highest percentage of women smoking with no education was Papua, and the provinces with the highest percentage of women smoking and using the Internet almost daily were Banten and East Java. In addition, the province with the highest percentage of women smoking with the lowest de jure wealth population quintile was Papua, and the province with the highest percentage of women smoking with the lowest percentage of women unemployed in the past 12 months was North Sulawesi. The suggestion that researchers can give based on the explanation above is the need for local government commitment to implementing and running smoke-free zones (SFZs). Consistent implementation of SFZs is expected to improve the degree of public health, especially controlling risk factors for disease and death caused by smoking and increasing community culture in clean and healthy living behavior. There is a need for persuasive smoking education for women by providing health education related to the negative effects of smoking through communication, information, and education (IEC) through mass media. In this regard, it is also necessary to develop basic data on smoking prevalence to monitor the prevalence and trend of tobacco consumption in the community through surveys. In addition, it is essential to establish an information system to monitor health problems caused by tobacco/smoking in at-risk areas.

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