

The Prevalence of Cancer in Indonesia: An Ecological Analysis

by Djazuly Chalidyanto

Submission date: 15-Jan-2022 09:17PM (UTC+0800)

Submission ID: 1742116161

File name: 3._IJFMT_July_2021_DOI_4_compressed-3028-3034.pdf (583.46K)

Word count: 2881

Character count: 15860

The Prevalence of Cancer in Indonesia: An Ecological Analysis

Hendrik Santoso¹, Djazuly Chalidyanto², Agung Dwi Laksono³

¹Magister Student, Master of Health Policy and Administration Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia, ²Lecturer, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia,

³Researcher, National Institute of Health Research and Development, the Indonesia Ministry of Health, Jakarta, Indonesia

Abstract

Cancer is one of the catastrophic diseases with the most considerable absorption of costs in the National Health Insurance-Indonesian Health Card (JKN-KIS) program. The study aimed at analyzing ecologically the factors related to the prevalence of cancer in Indonesia. The research carried out ecological analysis using secondary data from the Ministry of Health of the Republic of Indonesia in 2018. The study sampled all provinces. Apart from cancer, five other variables analyzed as independent variables were the percentage of preserved meat/chicken/fish, the percentage of fatty/cholesterol/fried foods, the percentage of e-cigarette smokers, the prevalence of diabetes mellitus, the prevalence of hypertension. Data were analyzed using scatter plots. The study results found that the higher the percentage of preserved meat/chicken/fish food consumption habits in a province, the higher the prevalence of cancer. The higher the rate of fatty/cholesterol/fried food consumption in an area, the higher the prevalence of cancer. Likewise, the higher the percentage of e-cigarette smokers in a province, the higher the prevalence of cancer. The higher the prevalence of diabetes mellitus in an area, the higher the prevalence of cancer. Finally, the higher the prevalence of hypertension in a province, the higher the prevalence of cancer. The study concluded that the five independent variables analyzed are related to the majority of cancer in Indonesia.

Keywords: ecological analysis, consumption habits, cancer, e-cigarette, hypertension, diabetes mellitus.

Background

Cancer is a group of diseases characterized by uncontrolled growth and the spread of abnormal cells. Cancer cells can spread to other parts of the body through the blood and lymph system. If the distance is uncontrollable, it can result in death. Cancer can affect everyone from children to older people, men, and women. The dominant cancers that occur in women are breast cancer and cervical cancer. For men, the most cancer is lung and colorectal, while in children, the most cancer is leukemia^{1,2}

According to the WHO (World Health Organization), cancer is the second leading cause of death globally.

Corresponding Author

Agung Dwi Laksono

E-mail: agung.dwi.laksono-2016@fkm.unair.ac.id

accounting for an estimated 9.6 million deaths, or one in six deaths, in 2018³. Meanwhile, from the Ministry of Health's data in 2020, cancer is the third leading cause of death in Indonesia after heart disease and stroke¹. According to Globocan²⁶, in 2020, Indonesia has reported 396,914 new cancer cases with a death rate of 234,511⁴. The incidence of cancer in Indonesia (136.2/100,000 population) ranks 8th in Southeast Asia, while in Asia, it is 23rd⁵.

Based on BPJS Health data, the cost of cancer treatment for the 2014-2018 period has spent IDR 13.3 trillion (17%) of the total cost of catastrophic diseases of IDR 78.3 trillion⁶. From WHO (World Health Organization) data, the cancer burden in Indonesia with the highest number of cases is breast cancer, and the highest number of deaths is lung cancer. Still, the percentage of cancer in Indonesia reached 18.6% of NCD's premature deaths⁷.

The risk factors for cancer consists of two, namely those that can be modified (modifiable) and those that cannot be modified (non-modifiable). The flexible examples include smoking behavior, being overweight, drinking alcohol, consuming red meat/processed foods (with preservatives), inadequate physical activity, and low-fiber diets⁸. Meanwhile, non-modifiable risk factors include age, gender, genetics, race, ethnicity, and previous medical history⁹. According to a study from American Cancer Society researchers, about 42% of cancer cases and 45% of cancer deaths in the United States are related to modifiable (preventable) risk factors⁸. Based on the background description above, this study aims to determine the aspects of Indonesia's prevalence of cancer.

Materials and Methods

Study Design

The authors designed the study using an ecological analysis approach. Ecological studies focus on comparisons between groups, not individuals. The data analyzed is aggregate data at a specific group or level, which in this study is the provincial level. An ecological analysis variable can be aggregate measurements, environmental measurements, or global measurements^{10,11}.

Data Source

The authors conducted this study using secondary data from the 2018 Indonesian Basic Health Research report. The Ministry of Health of the Republic of Indonesia

issued the survey report. The unit of analysis in this study is the province. The study analyzed all areas (34 provinces).

Data Analysis

The dependent variable in this study is the prevalence of cancer. This study only records cancer based on diagnosis by the doctor. Apart from the majority of cancer as the dependent variable, the study analyzed five independent variables. The independent variables consist of behavioral factors (percentage of preserved meat/chicken/fish, percentage of fatty/cholesterol/fried foods, percentage of e-cigarette smokers), and comorbid factors (prevalence of diabetes mellitus, the prevalence of hypertension)¹².

The study performs data analysis using univariate and bivariate methods. Meanwhile, the study employs bivariate analysis using scatter plots. This study uses a linear line of conformity to determine the relationship between cancer prevalence and the independent variable. The entire analysis process utilizes SPSS 21 software.

Results and Discussion

Table 1 provides descriptive statistics on cancer prevalence, and other variables analyzed in this study. The information presented in Table 1 shows very high variation between provinces. The lowest cancer prevalence reached 0.85% (West Nusa Tenggara province), while the highest cancer prevalence was 4.86% in DI Yogyakarta.

Table 1. Descriptive statistics variables of the prevalence of cancer in Indonesia

	Prevalence of Cancer	Percentage of Preserved meat/chicken/fish	Percentage of Fatty/cholesterol/fried foods	Percentage of E-Cigarette Smoker	Prevalence of Diabetes Mellitus	Prevalence of Hyper-tension
N	34	34	34	34	34	34
Mean	1.7591	20,5147	33.3265	2,5029	1.9059	8.1815
Median	1.5650	19,9000	33,2000	2.3500	1.7500	8.2450
Mode	1.32a	18.90a	10.30a	2.70a	1.30a	4.39a
Std. Deviation	0.69747	4.99855	11,15579	1.62602	0.62665	1,87549

Variance	0.486	24,986	124,452	2,644	0.393	3,517
Range	4.01	24.40	48.10	7.20	2.50	8.82
Minimum	0.85	6.70	10.30	0.20	0.90	4.39
Maximum	4.86	31.10	58.40	7.40	3.40	13.21

Source: The 2018 Indonesia Basic Health Research

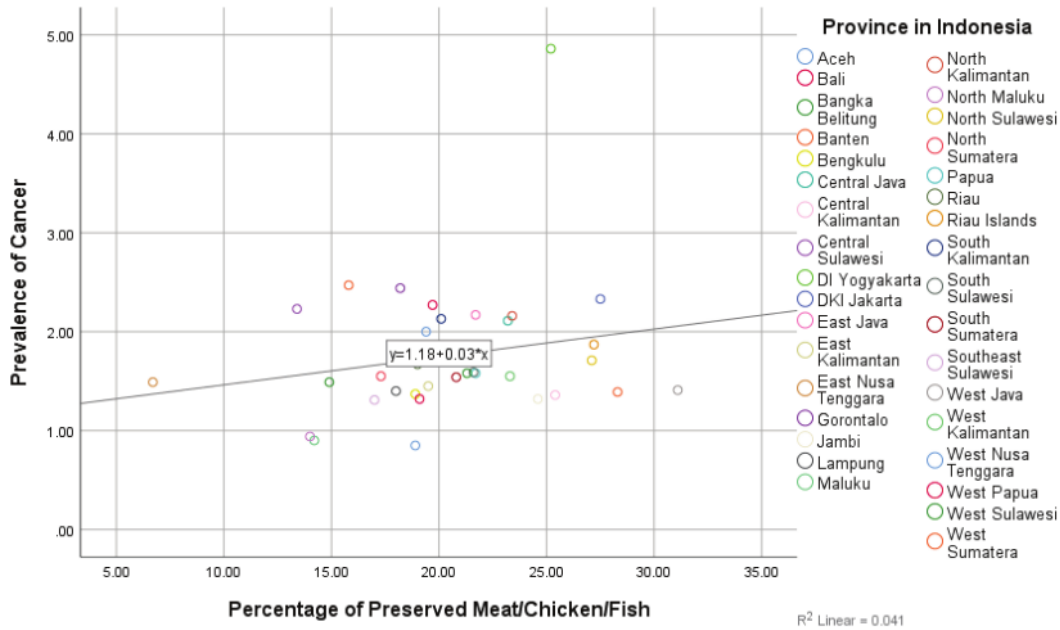


Figure 1. Scatter plot of the Prevalence of Cancer and Percentage of Preserved Meat/Chicken/Fish in Indonesia, 2018

Source: Indonesian Basic Health Research 2018

Figure 1 is a scatter plot between cancer prevalence and the percentage of preserved meat/chicken/fish in Indonesia. This figure shows that the relationship between the two variables shows a positive trend. The results mean that the higher the percentage of preserved meat/chicken/fish in a province, the higher the prevalence of cancer.

Analysis using a scatter plot shows a positive relationship between the percentage of preserved meat/

chicken/fish in a cancer prevalence province. The higher the rate of preserved meat/chicken/fish in a region, the higher the prevalence of cancer in that region too. This study indicates that preserved meat/chicken/fish is a risk factor for cancer. The result is consistent with the research results from the World Cancer Research Fund (2018), which states that consuming processed meat will increase the risk of colorectal cancer, and consuming preserved foods will increase the risk of stomach cancer¹³.

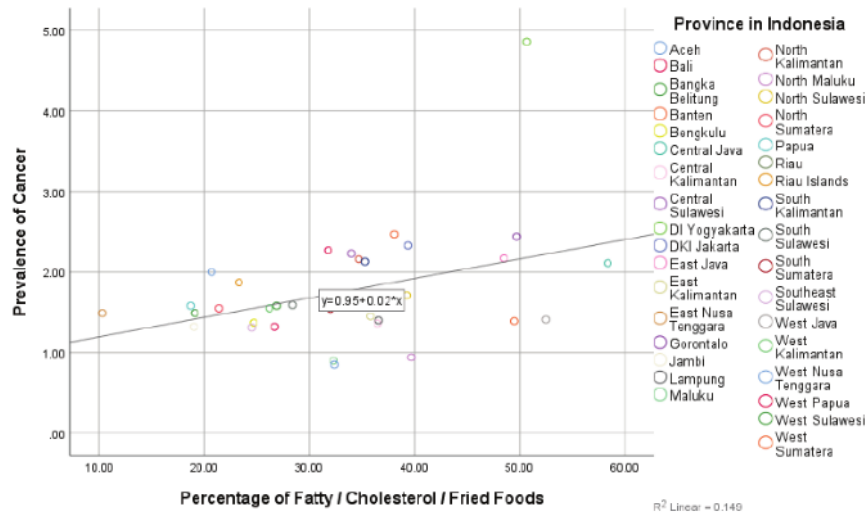


Figure 2. Scatter plot of the Prevalence of Cancer and Percentage of Fatty / Cholesterol / Fried Foods in Indonesia, 2018

Source: Indonesian Basic Health Research 2018

Figure 2 is a scatter plot between cancer prevalence. The figure shows that the relationship between the two variables shows a positive trend. The analysis result means that the higher the percentage of fatty/cholesterol/fried foods in a province, the higher the prevalence of cancer.

Likewise, with the analysis of the percentage of fatty/cholesterol/fried foods with the prevalence of cancer, the higher the rate of people consuming fatty/fried foods in an area, the higher the prevalence of cancer. This result is also stated in Lippi & Mattiuzzi's (2015) research that eating fried foods will increase the risk of prostate cancer 1.3 to 2.3 times¹⁴. In Garcia's study (2019), the study stated that consuming cholesterol foods was associated with an increased risk of breast cancer¹⁵.

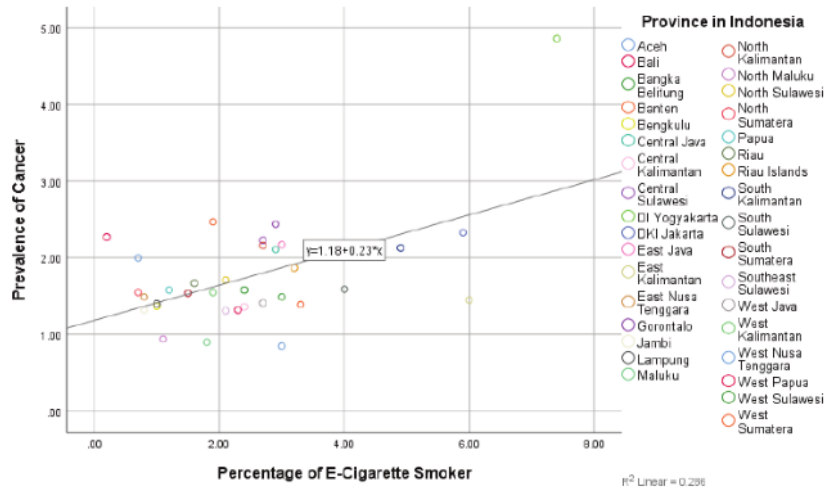


Figure 3. Scatter plot of the Prevalence of Cancer and Percentage of E-Cigarette Smokers in Indonesia, 2018

Source: Indonesian Basic Health Research 2018

Figure 3 is a scatter plot between cancer prevalence and the percentage of e-cigarette smokers in Indonesia. This figure shows that the relationship between the two variables shows a positive trend. The result means that the higher the rate of e-cigarette smokers in a province, the higher the prevalence of cancer.

Many studies have shown that smoking is associated with cancer prevalence, and the results from scatter plot analysis of the percentage of e-cigarette smokers with cancer prevalence. The more e-cigarette smokers in a province, the higher the prevalence of cancer in that province. In Cancer Prevention Research, several studies on the relationship of e-cigarettes with cancer state that e-cigarettes can increase cancer risk in both mice and humans^{16,17}.

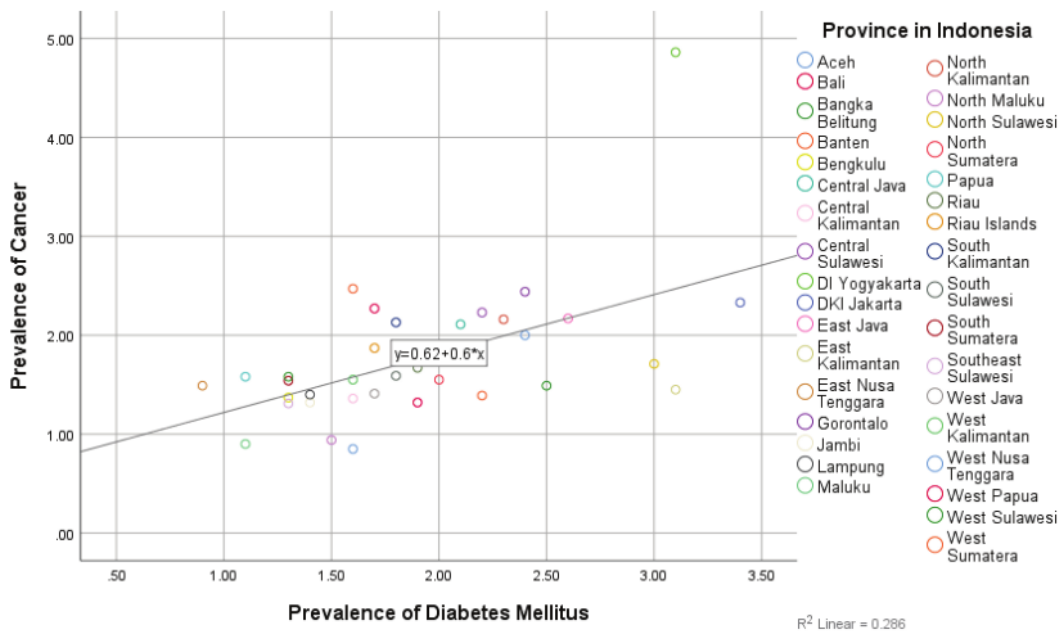


Figure 4. Scatter plot of the Prevalence of Cancer and ²¹Prevalence of Diabetes Mellitus in Indonesia, 2018

Source: Indonesia Basic Health Research 2018

Figure 4 is a scatter plot between cancer prevalence and the prevalence of diabetes mellitus in Indonesia. This figure shows that the relationship between the two variables show ²⁴ positive trend. The finding means that the higher the prevalence of diabetes mellitus in a province, the higher the prevalence of cancer. In diabetes and cancer, several ²² previous studies show that people with diabetes have an increased risk of developing cancer. Also, in the study, the conclusion was there is a slight increase in the risk of developing breast cancer among women with type 2 diabetes^{18,19}.

Figure 5 is a scatter plot between the prevalence of cancer and the prevalence of hypertension in Indonesia. This figure shows that the relationship between the two

variables shows a positive trend. The analysis result means that the higher the prevalence of hypertension in a province, the higher the prevalence of cancer.

Finally, the analysis shows that the higher the prevalence of hypertension in a province, the higher the cancer prevalence in the region. The finding supported ²⁵ research by Seretis et al. (2019), which states that people with hypertension have a higher risk factor for kidney, colorectal, and breast cancer²⁰. In ¹⁹ previous research, two studies concluded a significant association between hypertension and breast cancer risk. It is precisely for postmenopausal hypertensive women^{21,22}.

The research carried out using an approach to ecological analysis has drawbacks in its use as a policy

basis since the data used is aggregated data at the provincial level. More research at the personal level is required to obtain more reliable information on intervention policy decisions^{23,24}.

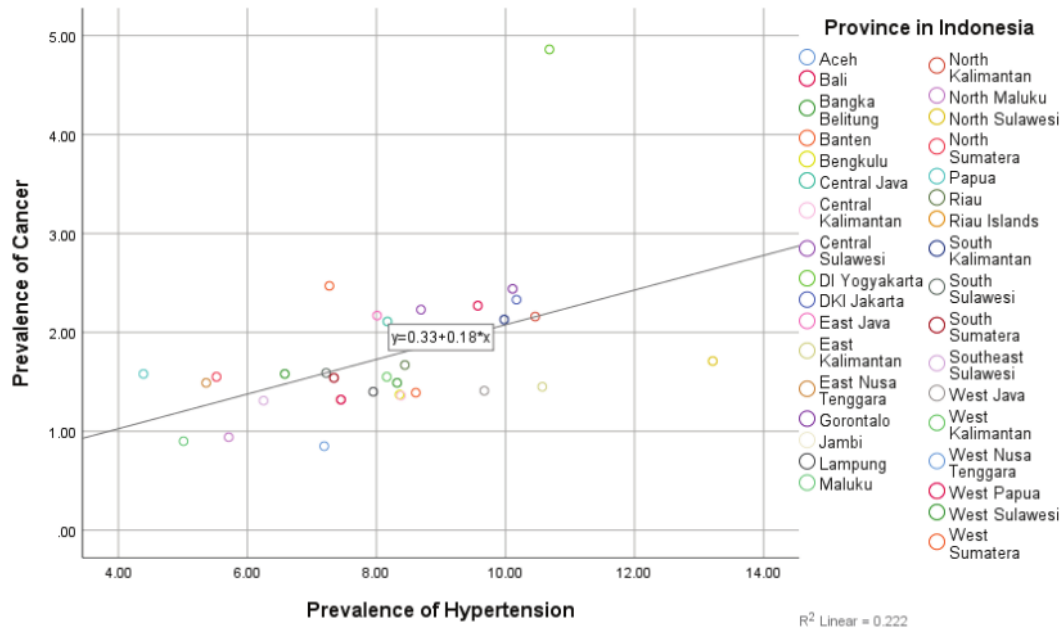


Figure 5. Scatter plot of the Prevalence of Cancer and Prevalence of Hypertension in Indonesia, 2018

Source: Indonesian Basic Health Research 2018

Conclusions

The authors concluded that the five independent variables ecologically analyzed are related to Indonesia’s cancer prevalence based on the research results. The five variables are the percentage of preserved meat/chicken/fish, the percentage of fatty/cholesterol/fried foods, the percentage of e-cigarette smokers, the prevalence of diabetes mellitus, and the majority of hypertension.

Acknowledgments: The author would like to thank the Ministry of Health of the Republic of Indonesia. The institution was providing the report, which was the source of the data in this study.

Source of Funding: Self-funding

Ethical Clearance: The study conducted using secondary data from published reports. Ethical clearance is therefore not required in the conduct of this study.

Conflicting Interests: The authors declared no potential conflicts of interest concerning the research,

authorship, and publication of this article.

References

1. The Ministry of Health of The Republic of Indonesia. This type of cancer is vulnerable to attacking humans (Jenis kanker ini rentan menyerang manusia) [Internet]. 2021 [cited 2021 Feb 16]. Available from: <https://www.kemkes.go.id/article/view/20011400002/jenis-kanker-ini-tertentu-menyerang-manusia.html>
2. Roh S, Burnette CE, Lee Y-S, Jun JS, Lee HY, Lee KH. Breast cancer literacy and health beliefs related to breast cancer screening among American Indian women. Soc Work Health Care. 2018;57(7):465–82.
3. World Health Organization. Cancer [Internet]. 2021 [cited 2021 Feb 16]. Available from: https://www.who.int/health-topics/cancer#tab=tab_1
4. Globocan. 360 Indonesia fact sheets [Internet]. 2020 [cited 2021 Feb 16]. Available from: <https://gco.iarc.fr/today/data/factsheets/populations/360-indonesia-fact-sheets.pdf>

5. The Ministry of Health of The Republic of Indonesia. Cancer in Indonesia ranks 8th in Southeast Asia and 23rd in Asia (Penyakit Kanker di Indonesia Berada Pada Urutan 8 di Asia Tenggara dan Urutan 23 di Asia) [Internet]. 2020 [cited 2021 Feb 16]. Available from: <http://p2p.kemkes.go.id/penyakit-kanker-di-indonesia-berada-pada-urutan-8-di-asia-tenggara-dan-urutan-23-di-asia/>
6. Ekonomi W. BPJS Spends IDR 13.3 Trillion for Cancer (BPJS Kesehatan Habiskan Rp13,3 Triliun untuk Penyakit Kanker) [Internet]. 2021 [cited 2021 Feb 16]. Available from: <https://www.wartaekonomi.co.id/read245208/bpjs-kesehatan-habiskan-rp133-triliun-untuk-penyakit-kanker>
7. World Health Organization. Cancer Country Profile 2020 - Indonesia [Internet]. 2020. Available from: https://www.who.int/cancer/country-profiles/IDN_2020.pdf?ua=1
8. Cancer.org. More than 4 in 10 Cancers and Cancer Deaths Linked to Modifiable Risk Factors [Internet]. 2020. Available from: https://www.who.int/cancer/country-profiles/IDN_2020.pdf?ua=1
9. Myers D. Colon Cancer: Causes and Risk Factors [Internet]. 2020. Available from: <https://www.verywellhealth.com/colon-cancer-causes-risk-factors-796786>
10. Utami SM, Handayani F, Hidayah M, Wulandari RD, Laksono AD. Ecological Analysis of Preeclampsia/Eclampsia Case in Sidoarjo Regency, Indonesia, 2015-2019. *Indian J Forensic Med Toxicol.* 2020;14(4):3474–9.
11. Laksono AD, Kusriani I. Ecological Analysis of Stunted Toddler in Indonesia. *Indian J Forensic Med Toxicol.* 2020;14(3):1685–91.
12. National Institute of Health Research and Development of The Indonesia Ministry of Health. The 2018 Indonesia Basic Health Survey (Riskesdas): National Report [Internet]. Jakarta; 2019. Available from: http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan%7B%5C_%7D%20Nasional%7B%5C_%7D%20DRKD2018%7B%5C_%7DFINAL.pdf
13. Fiolet T, Srour B, Sellem L, Kesse-Guyot E, Allès B, Méjean C, et al. Consumption of ultra-processed foods and cancer risk: results from NutriNet-Santé prospective cohort. *BMJ.* 2018;360:k322.
14. Lippi G, Mattiuzzi C. Fried food and prostate cancer risk: systematic review and meta-analysis. *Int J Food Sci Nutr.* 2015;66(5):587–9.
15. Garcia-Estevez L, Moreno-Bueno G. Updating the role of obesity and cholesterol in breast cancer. *Breast Cancer Res.* 2019;21(1):35.
16. O’Keeffe LM, Taylor G, Huxley RR, Mitchell P, Woodward M, Peters SAE. Smoking as a risk factor for lung cancer in women and men: A systematic review and meta-analysis. *BMJ Open.* 2018;8(10):1–12.
17. Jones ME, Schoemaker MJ, Wright LB, Ashworth A, Swerdlow AJ. Smoking and risk of breast cancer in the Generations Study cohort. *Breast Cancer Res.* 2017;19(1):1–14.
18. Soltani S, Abdollahi S, Aune D, Jayedi A. Body mass index and cancer risk in patients with type 2 diabetes: a dose–response meta-analysis of cohort studies. *Sci Rep.* 2021;11(1):Article number 2479.
19. Ling S, Brown K, Miksza JK, Howells LM, Morrison A, Issa E, et al. Risk of cancer incidence and mortality associated with diabetes: A systematic review with trend analysis of 203 cohorts. *Nutr Metab Cardiovasc Dis.* 2021;31(1):14–22.
20. Seretis A, Cividini S, Markozannes G, Tseretopoulou X, Lopez DSDS, Ntzani EE, et al. Association between blood pressure and risk of cancer development: a systematic review and meta-analysis of observational studies. *Sci Rep.* 2019;9(1):8565.
21. Han H, Guo W, Shi W, Yu Y, Zhang Y, Ye X, et al. Hypertension and breast cancer risk: a systematic review and meta-analysis. *Sci Rep.* 2017;7:44877.
22. Christakoudi S, Kakourou A, Markozannes G, Tzoulaki I, Weiderpass E, Brennan P, et al. Blood pressure and risk of cancer in the European Prospective Investigation into Cancer and Nutrition. *Int J Cancer.* 2020;146(10):2680–93.
23. Morgenstern H. Ecologic Studies in Epidemiology: Concepts, Principles, and Methods. *Annu Rev Public Health.* 1995;16:61–81.
24. Laksono AD, Sandra C. Ecological Analysis of Healthcare Childbirth in Indonesia (Analisis Ekologi Persalinan di Fasilitas Pelayanan Kesehatan di Indonesia). *Bull Heal Syst Res.* 2020;23(1):1–9.

The Prevalence of Cancer in Indonesia: An Ecological Analysis

ORIGINALITY REPORT

18%

SIMILARITY INDEX

16%

INTERNET SOURCES

13%

PUBLICATIONS

8%

STUDENT PAPERS

PRIMARY SOURCES

1	repository.unusa.ac.id Internet Source	2%
2	Submitted to University of New England Student Paper	1%
3	Submitted to University of Southern California Student Paper	1%
4	Wiwin Elis Sumarni, Lia Nurcahyani. "PERCEPTION OF WOMEN OF CHILDBEARING AGE ON EARLY DETECTION OF CERVICAL CANCER WITH IVA TEST IN THE BASIC ESSENTIAL NEONATAL OBSTETRICS SERVICES CIPEUNDEUY COMMUNITY HEALTH CENTER SUBANG REGENCY", International Seminar of Gender Equity Maternal and Child Health, 2021 Publication	1%
5	mail.gmj.ir Internet Source	1%
6	journal.stikespemkabjombang.ac.id Internet Source	1%

7	www.cureus.com Internet Source	1 %
8	www.ijicc.net Internet Source	1 %
9	www.frontiersin.org Internet Source	1 %
10	www.mdpi.com Internet Source	1 %
11	www.mordorintelligence.com Internet Source	1 %
12	D Frianto, I Prihartini, E Novriyanti, A Y P B C Widyatmoko. "The genetic potential of <i>Taxus sumatrana</i> medicinal plants in Kerinci Regency", IOP Conference Series: Earth and Environmental Science, 2021 Publication	1 %
13	Agung Dwi Laksono, Ratna Dwi Wulandari, Ratu Matahari. "The Determinant of Health Insurance Ownership Among Pregnant Women in Indonesia", Research Square, 2020 Publication	1 %
14	jonuns.com Internet Source	1 %
15	Submitted to Western Governors University Student Paper	<1 %

16	bpac.org.nz Internet Source	<1 %
17	ejobios.org Internet Source	<1 %
18	jurnal-jkn.bpjs-kesehatan.go.id Internet Source	<1 %
19	www.nature.com Internet Source	<1 %
20	Agung Dwi Laksono, Ratna Dwi Wulandari, Ratu Matahari. "Does a Husband's Education Matter in Antenatal Care Visits Involvement?: Study on the Poor in Indonesia", Research Square, 2020 Publication	<1 %
21	idoc.pub Internet Source	<1 %
22	Ahmad Naghibzadeh Tahami, Maryam Marzban, Vahid Yazdi Feyzabadi, Shahryar Dabiri et al. "Is Opium Use Associated with an Increased Risk of Lung Cancer? A Case-Control Study", Research Square, 2019 Publication	<1 %
23	www.antiessays.com Internet Source	<1 %
24	www.scribd.com Internet Source	<1 %

25

Kun Xuan, Tianming Zhao, Chenyu Sun, Akash S. Patel, Haixia Liu, Xin Chen, Guangbo Qu, Yehuan Sun. "The association between hypertension and colorectal cancer: a meta-analysis of observational studies", European Journal of Cancer Prevention, 2020

Publication

<1 %

26

Patiyus Agustiansyah, Rizal Sanif, Siti Nurmaini, Irfannuddin, Legiran. "Epidemiology and Risk Factors for Cervical Cancer", Bioscientia Medicina : Journal of Biomedicine and Translational Research, 2021

Publication

<1 %

Exclude quotes On

Exclude matches < 5 words

Exclude bibliography On