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**PROBABILITY OF DEMOGRAPHIC AND ECONOMIC FACTORS ON
 TOBACCO CIGARETTE CONSUMPTIONS IN INDONESIA**

**PRAWDOPODOBIENSTWO WPŁYWU CZYNNIKÓW
 DEMOGRAFICZNYCH I EKONOMICZNYCH NA KONSUMPCJĘ
 PAPIEROSÓW TYTONIOWYCH W INDONEZJI**

**Hendry Cahyono^{1,A,E,F}, Dyah Wulan Sari^{2,E,G}, Wenny Restikasari^{1,B-C},
 Qatrunnada Salsabila^{1,F}, Zain Fuadi Muhammad RoziqiFath^{1,D,F},
 Nur Azirah Zahida Mohamad Azhar^{3,E,G}**

¹Faculty of Economics and Business, Universitas Negeri Surabaya, Indonesia

²Faculty of Economics and Business, Universitas Airlangga, Indonesia

³Faculty of Management and Business, Universiti Teknologi Mara, Malaysia

¹Wydział Ekonomii i Biznesu, Uniwersytet Państwowy w Surabaji, Indonezja

²Wydział Ekonomii i Biznesu, Uniwersytet Airlangga, Indonezja

³Wydział Zarządzania i Biznesu, Uniwersytet Technologiczny Mara, Malezja

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Abstract

Subject and Purpose of the Work: Tobacco consumption in Indonesia is a significant public health challenge, with economic and demographic factors playing a crucial role in shaping individual smoking behaviour. This study seeks to identify determinants that influence smoking status at the individual level. Cigarette consumption (both factory-made and hand-rolled) is defined as a binary dependent variable.

Materials and Methods: Using 2020 SUSENAS data (n=776,576), binary logistic regression examined factors like age, gender, marital status, education, income, health insurance, and assets. The analysis incorporates pseudo R-square, simultaneous, and partial tests to assess model fit and variable significance.

Results: The findings indicate that age, gender, marital status, education level, health insurance ownership, and asset ownership significantly influence the probability of tobacco cigarette consumption. Notably, health insurance ownership and asset ownership serve as protective factors, reducing the likelihood of smoking. Contrary to conventional economic theory, household income does not show a significant impact on smoking behavior in the Indonesian context.

Conclusion: This study concludes that demographic factors and economic security indicators – particularly health insurance and asset ownership – play a critical role in shaping tobacco consumption decisions in Indonesia. The non-significance of income highlights the unique

Address for correspondence / Adres korespondencyjny: Hendry Cahyono, Faculty of Economics and Business, Universitas Negeri Surabaya, Surabaya, Indonesia; (email: hendrycahyono@unesa.ac.id)

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socio-cultural and addictive nature of smoking in Indonesia, which may limit the effectiveness of income-based policy measures. The results underscore the need for integrated public health strategies that combine education, health insurance expansion, asset-building initiatives, and targeted excise policies to reduce smoking prevalence effectively.

Keywords: tobacco, cigarettes, demography, logistic regression, health insurance, smoking behavior

Streszczenie

Przedmiot i cel pracy: Spożycie tytoniu w Indonezji stanowi poważne wyzwanie dla zdrowia publicznego, a czynniki ekonomiczne i demograficzne odgrywają kluczową rolę w kształtowaniu indywidualnych zachowań związanych z paleniem. Niniejsze badanie ma na celu zidentyfikowanie czynników determinujących status palenia na poziomie indywidualnym. Spożycie papierosów (zarówno fabrycznych, jak i ręcznie zwijanych) definiuje się jako zmienną zależną binarną.

Materiały i metody: Wykorzystując dane SUSENAS z 2020 r. (n=1 002 741), w ramach regresji logistycznej dwuwymiarowej zbadano takie czynniki, jak wiek, płeć, stan cywilny, wykształcenie, dochody, ubezpieczenie zdrowotne i aktywa. Analiza obejmuje testy pseudo R-kwadrat, testy symultaniczne i częściowe w celu oceny dopasowania modelu i istotności zmiennych.

Wyniki: Wyniki badań wskazują, że wiek, płeć, stan cywilny, poziom wykształcenia, posiadanie ubezpieczenia zdrowotnego oraz posiadanie aktywów mają znaczący wpływ na prawdopodobieństwo palenia papierosów tytoniowych. Warto zauważyć, że posiadanie ubezpieczenia zdrowotnego i aktywów stanowi czynnik ochronny, zmniejszający prawdopodobieństwo palenia. W przeciwieństwie do konwencjonalnej teorii ekonomicznej, dochód gospodarstwa domowego nie ma znaczącego wpływu na zachowania związane z paleniem w kontekście indonezyjskim.

Wnioski: W niniejszym badaniu stwierdzono, że czynniki demograficzne i wskaźniki bezpieczeństwa ekonomicznego – w szczególności ubezpieczenie zdrowotne i posiadanie aktywów – odgrywają kluczową rolę w kształtowaniu decyzji dotyczących konsumpcji tytoniu w Indonezji. Brak znaczenia dochodów podkreśla wyjątkowy charakter społeczno-kulturowy i uzależniający palenia tytoniu w Indonezji, co może ograniczać skuteczność środków politycznych opartych na dochodach. Wyniki podkreślają potrzebę zintegrowanych strategii zdrowia publicznego, łączących edukację, rozszerzenie ubezpieczenia zdrowotnego, inicjatywy budowania aktywów i ukierunkowane polityki akcyzowe w celu skutecznego ograniczenia rozpowszechnienia palenia tytoniu.

Słowa kluczowe: tytoń, papierosy, demografia, regresja logistyczna, ubezpieczenie zdrowotne, zachowania związane z paleniem

Introduction

The Tobacco Products Industry (IHT) remains a strategically important and highly competitive sector in Indonesia, providing significant employment, regional economic support, and substantial state revenue primarily through excise tax – reaching IDR 188.8 trillion in 2021, a 10.9% annual increase (Nasir et al., 2023; Verona et al., 2022). However, this economic contribution is overshadowed by a severe public health crisis: cigarette consumption has risen by 8.8 million people in the last decade, based on the Ministry of Health (2021), directly driving increased morbidity, mortality, and staggering economic costs (Alcaraz et al., 2016; Connolly et al., 2018). In 2010, tobacco-related expenditure totalled IDR 231.27 trillion, encompassing direct cigarette purchases (IDR 138 trillion), healthcare costs (IDR 2.11 trillion), and productivity losses from premature death (IDR 91.16 trillion (Swarnata, Kamilah, Melinda, et al., 2024). Critically, this burden manifests uniquely in Indonesia, where studies indicate households prioritise cigarette expenditure over essential needs like food, even during income increases (Djutaharta et al., 2022; Swarnata, Kamilah, Wisana, et al., 2024), creating a complex socio-economic trap.

Addressing this dual challenge requires understanding the granular drivers of individual consumption behaviour. While global research identifies common determinants like age, education, income, and cigarette affordability (Malta et al., 2021; Mostofsky et al., 2024), their interaction within Indonesia's *specific context* is crucial. Demographic shifts, such as smoking initiation moving to young adulthood (Cardarelli et al., 2021), combine with distinct socioeconomic vulnerabilities – including lower health literacy among less-educated groups (Tomioka et al., 2020) 617 men and 33,934 women and the persistent, inequitable impact of smoking on low-income populations despite control efforts (Keller et al., 2020). Crucially, the limited efficacy of broad policy tools like annual excise tax increases in curbing consumption among vulnerable groups highlights the need for a more nuanced analysis of individual-level factors, particularly those reflecting financial security and healthcare access (Hoek & Smith, 2016).

This study directly addresses this need by analysing the opportunity trends of key demographic (age, gender, marital status) and economic (education, income, asset ownership) factors on cigarette consumption in Indonesia, employing recent, nationally representative data (SUSENAS 2020) and robust binary logistic regression. Its primary contribution lies in integrating two critical, yet underexplored, individual-level determinants: health insurance ownership and asset ownership (Kostova et al., 2018). We posit that these variables offer a novel empirical lens: health insurance signifies potential healthcare access and risk perception, while asset ownership reflects economic resilience beyond mere income. Understanding their distinct influence is vital for designing effective interventions, as they may either mitigate or exacerbate the impact of traditional socioeconomic vulnerabilities on smoking behaviour within the Indonesian setting (Effendi et al., 2024).

Despite recognition of socioeconomic and demographic influences on smoking, a significant gap exists in understanding how specific Indonesian contextual factors, particularly individual financial security (assets) and healthcare access (insurance), distinctly shape consumption decisions. Existing policies, heavily reliant on excise taxes, demonstrably fail to equitably reduce consumption across all demographic strata, especially among low-SES groups disproportionately affected (Keller et al., 2020; Nargis et al., 2019). More than 315 million or around 26.9% of the adult population in China were smokers-50.6% among men and 2.2% among women. Growing affordability of cigarettes led to increased cigarette consumption in China to the detriment of public health. This study investigated whether the level and growth in cigarette affordability in China was equally shared by smokers from all demographic and socio-economic statuses (SES). Therefore, this study's novelty stems from its explicit focus on analysing health insurance ownership and asset ownership as key, yet systematically underexplored, determinants within Indonesia's unique socio-economic and policy landscape. By moving beyond conventional variables, it aims to provide targeted insights essential for developing more equitable and effective tobacco control strategies tailored to Indonesia's specific challenges.

Theoretical Framework

The consumption of tobacco, an addictive good, cannot be adequately explained by standard neo-classical models of rational choice. Instead, it requires a theoretical framework that accounts for habit persistence, self-control problems, and the socio-cultural embeddedness of consumption choices. This analysis integrates the rational addiction theory (Becker & Murphy, 1988) as its core microeconomic foundation, augmented by insights from behavioral economics and the Health Belief Model. This integrated model is then contextualized within Indonesia's unique socio-economic and cultural landscape to identify the specific determinants and pathways driving cigarette consumption.

Becker and Murphy's (1988) Rational Addiction Theory provides a pivotal economic framework for analyzing cigarette demand. It models consumers as forward-looking individuals who account for the future consequences of their current addictive consumption. In this model, past consumption increases the marginal utility of present consumption (adjacent complementarity), leading to habit formation. Consequently, price elasticity is higher in the long run than in the short run, as addicted consumers gradually adjust their stock of addiction. However, this model's assumption of perfect rationality is often challenged by observed behaviors. Therefore, behavioral economic concepts such as present bias (Laibson, 1997) and limited self-control (O'Donoghue & Rabin, 1999) are incorporated. Present bias explains why individuals may consistently overconsume addictive substances despite long-term health intentions, creating a cycle of time-inconsistent preferences. This theoretical blend moves beyond aggregate consumption relationships to model the individual-level decision dynamics of an addictive good.

The empirical literature on smoking determinants can be synthesized into three interacting clusters: (1) economic and demographic fundamentals, (2) policy and price mechanisms, and (3) socio-cultural and cognitive factors. First, core economic variables such as income and education consistently show strong correlations with smoking behavior (Chaloupka & Warner, 2000). However, the gradient of

this relationship is culturally contingent. For instance, while higher education typically reduces smoking prevalence in high-income countries (Jha & Peto, 2014), its effect may be attenuated in settings where smoking is deeply entrenched in social rituals (Assari & Bazargan, 2020). Second, the effectiveness of taxation and price policy is well-established in the health economics literature (e.g., Grossman et al., 1993), but household budget reallocation effects – where increased cigarette spending crowds out expenditure on nutritional food (Djutaharta et al., 2021) – highlight the complex welfare implications in low-income households. Third, a significant research gap exists in integrating country-specific socio-cultural norms into economic models of addiction, as most models treat culture as a residual factor rather than a central determinant.

This study addresses the identified gap by proposing a context-sensitive framework where Indonesia-specific socio-cultural and economic structures act as central moderators within the integrated rational addiction-behavioral economics model. It is argued that the efficacy of standard economic levers – such as price elasticity and the income-consumption gradient – is fundamentally filtered through local institutions. A primary moderator is the cultural embeddedness of *kretek* (clove cigarettes), which functions not merely as an addictive good but as a cultural artifact integral to social bonding (*silaturahmi*), tradition, and identity. This cultural utility can be modeled as a shift parameter enhancing the addictive stock's durability and potentially dampening short-term price sensitivity. Concurrently, the structural conditions of Indonesia's vast informal economy, characterized by irregular income streams, likely exacerbate behavioral imperfections such as present bias and liquidity constraints. This exacerbation can make addicted individuals more susceptible to harmful coping strategies, like reducing essential food expenditure, rather than cessation, when faced with price shocks. Furthermore, the model must account for powerful normative forces, exemplified by the extreme gender disparity in smoking prevalence. Prevailing gender norms act as pervasive social nudges, creating divergent default options and altering the perceived costs and benefits (e.g., social stigma versus social capital) of smoking initiation and cessation across genders.

Methodology of the study

Research Design and Data Analysis Technique

The analytical method used in this research is logistic regression analysis which is used to analyze individual decisions to consume tobacco cigarettes and the factors that influence. Logistic regression can also be used to predict the dependent variable in determining the percentage of variance in the dependent variable that can be explained by the independent variable, as well as to determine the relative importance of the independent variable to the dependent variable (Creswell & Creswell, 2017). After considering the substance, theory, and variables to be reviewed, this study will use the following model:

$$\text{Exp}\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 \text{Age}_i + \beta_5 \text{Ins}_i + \beta_2 \text{Gend}_i + \beta_3 \text{Mar}_i + \beta_4 \text{Edu}_i + \beta_6 \text{Inc}_i + \beta_7 \text{Ass}_i + e_i$$

(zain ini tolong disesuaikan dengan tabel di atas.

Which $\text{Exp}\left(\frac{P_i}{1-P_i}\right)$ is odd ratio which explains the tendency of individual opportunities to consume cigarettes, the independents variable denote *Age*, *Gen*, *Mar*, *Inc*, *Ins*, and *Ass*. The notation β are parameters and e denote error terms. The subscripts i show the cross section. As a robustness check on the logistic regression model specification, this analysis also estimated the same model using the probit regression method to ensure consistency and reliability of the findings.

Parameter estimation in logistic and probit regression analysis is performed using the maximum likelihood method. Statistical significance is reported at confidence levels of 1%, 5%, and 10%. Model goodness-of-fit is evaluated using the Pseudo R^2 value, with the understanding that in behavioural models with large samples, even seemingly simple values can provide meaningful information. The simultaneous

tests were performed to test the significance of all independent variables to the model, using statistics based on the Likelihood function. While, partial tests were performed to test the significant influence of each independent variable individually, by comparing z-test statistics. The interpreting results in this study using marginal effect which provide a more intuitive interpretation of the magnitude of probability changes in percentage units. All standard errors are grouped at the primary sampling unit level to account for correlations in survey sample clusters.

Data Usage

The data used in this study from National Socio-Economic Survey (SUSENAS) 2020. This survey conducted by the Central Statistics Agency (BPS) of the Republic Indonesia with designed to obtain social economics household. The target population in this survey was all ordinary households in the territory of Indonesia. Specially, this research employs a dataset of 776,576 member households who age above 21 years. This sample was chosen because of Indonesian government regulations that set a minimum age limit for people who smoke above 21 years (Nurhasana et al., 2022; Utami, 2020). This dataset distributed across 33 provinces in Indonesia. From Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung Islands, Riau Islands, DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, Banten, Bali, West Nusa Tenggara, East Nusa Tenggara, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, West Sulawesi, Maluku, North Maluku, West Papua, and also Papua.

Furthermore, the purpose of this research to identify the factor that influence individual smoking status. The dependent variable is is dichotomous, where a value of 1 is assigned to individuals who report consuming tobacco cigarettes, whether manufactured or hand-rolled, during the survey period. A value of 0 is assigned to individuals who do not report consuming cigarettes. Table 1 explain descriptive statistic data that used in this study

Table 1. Descriptive Statistic

Variables		Unit	Mean	Min	Max	Percent
Smoke	1	binary dummy				27.718%
	0					72.282%
Age		ratio	33.587	5.000	97.000	
Gender	1	binary dummy				49.105%
	0					50.895%
Status	1	binary dummy				14.204%
	0					85.796%
Ins	1	binary dummy				74.973%
	0					25.027%
Educ	1	binary dummy				18.519%
	0					81.481%
Urban	1	binary dummy				41.875%
	0					58.125%
Number observation						776,576

Note: The mean is referred to the arithmetic mean while Min and Max show minimum and maximum score, and percent mean is percentage.

Source: authors compiled.

The independent variables are social and demographic. The age (*Age*) measured by number of years member household. Gender (*Gender*) is binary dummy, where (male=1) and otherwise. The marital status (*Status*) show that marital status (married=1) and otherwise while unmarried or divorce. The binary is

used to explain number of household have insurance (*Ins*) or not. The level of education (*Educ*) is binary dummy 1 if finished senior high school, 0 if otherwise. This research also accommodate regional area (*urban*) is 1 if in urban, and 0 is otherwise.

Results

The coefficient of determination of logistic regression can be seen through the *pseudo R-square* value in table 2. The result show *pseudo R-square* value is 0.397, it means that the variation in the incidence of consuming cigarettes can be explained by the independent variable by 39 percent and the rest is explained by other variables outside the model.

Table 2. Simultaneous Test Result

Number of Observation	Prob > chi ²	Pseudo R ²
1.002.741	0.000	0.397

Source: author's calculation.

Furthermore, the simultaneous test results in table 3 show that the *p-value* is less than 0.050, which is 0.000. This means that there is at least one independent variable that has an influence on the consumption of tobacco cigarettes.

Table 3. Simultaneous Test Result

Number of Observation	LR chi ² (7)	Prob > chi ²
1.002.741	404699.36	0.0000

Source: author's calculation.

The partial test result shows that the independent variable with a *p-value* less than 0.010 has a significant effect on dependent variable. Based on table 4, there are six independent variables have significant effect than influence consumption of tobacco cigarettes, namely age (*Age*), ownership (*Ins*), gender (*Gend*), marital status (*Mar*), education head of household (*Edu*), and asset (*Ass*). Otherwise, income (*Inc*) has no impact influence consumption of tobacco cigarettes.

Table 4. Partial Test Results

Variables	Chi ²	P-value
<i>Age</i>	4312.050	0.000
<i>Ins</i>	873.280	0.000
<i>Gend</i>	110000.000	0.000
<i>Mar</i>	17254.580	0.000
<i>Edu</i>	1514.620	0.000
<i>Inc</i>	0.740	0.391
<i>Ass</i>	298.190	0.000

Source: author's calculation.

The interpretation of results shows in Table 5, coefficient age variable shows a significant negative sign. It means each increasing age, individuals will begin to recognize new associations and environments where environmental factors themselves have a considerable influence people to become smokers. Furthermore, smoking also a symbol of power and masculinity (Kautsar & Nizamie, 2021). As for adults themselves, the average age starts smoking during adolescence. According to data in the Tobacco Atlas,

(2020) as many as 52.100 percent of individuals in Indonesia started smoking in the age range of 15-19 years and 23.100 percent started smoking at the age of 10-14 years. This is because cigarettes contain addictive substances that can cause addiction, so it is not surprising that the increasing age of individuals tends to increase their cigarette consumption.

Table 5. Estimation Regression

Variables	Logistics				Probit			
	Model 1		Model 2		Model 3		Model 4	
	Logistics	Marginal Effect	Logistics	Marginal Effect	Probit	Marginal Effect	Probit	Marginal Effect
<i>Constant</i>	-3.276***		-3.339***		-1.608***		-1.646***	
	(0.019)		(0.020)		(0.009)		(0.009)	
<i>age</i>	-0.0203***	-0.002***	-0.020***	-0.002***	-0.011***	-0.002***	-0.011***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
<i>gender</i>	4.854***	0.549***	4.849***	0.549***	2.492***	0.549***	2.488***	0.549***
	(0.016)	(0.001)	(0.016)	(0.001)	(0.006)	(0.001)	(0.006)	(0.001)
<i>status</i>	-0.526***	-0.039***	-0.542***	-0.040***	-0.288***	-0.054***	-0.298***	-0.056***
	(0.010)	(0.001)	(0.010)	(0.001)	(0.006)	(0.001)	(0.006)	(0.001)
<i>educ</i>	-0.791***	-0.057***	-0.809***	-0.058***	-0.454***	-0.082***	-0.464***	-0.083***
	(0.009)	(0.001)	(0.009)	(0.001)	(0.005)	(0.001)	(0.005)	(0.001)
<i>ins</i>	-0.197***	-0.018***	-0.212***	-0.019***	-0.118***	-0.026***	-0.127***	-0.028***
	(0.008)	(0.001)	(0.008)	(0.001)	(0.004***)	(0.001)	(0.004***)	(0.001)
<i>urban</i>	-0.211***	-0.018***			-0.129***	-0.027***		
	(0.007)	(0.001)			(0.004)	(0.001)		
<i>LR chi²</i>		366519.440		365512.430		364666.190		363604.550
<i>Pseudo R²</i>	0.399		0.398		0.397		0.396	0.399
Number Observations								776,576

Note: Standard errors are in parentheses. ***, **, and * denote significance at alpha 1%, 5%, and 10% respectively.

Source: author's calculation (2025).

Table 5 presents the results of logistic and probit regression estimates to identify factors that influence the probability of individuals smoking in Indonesia. Models 1 and 2 use a logistic approach, while Models 3 and 4 use probit, with the difference being the inclusion of the region variable (urban). The results show high consistency between the two methods, characterised by similar signs and significance of coefficients. The gender variable (male) has the highest positive coefficient, confirming a large gender disparity in smoking behaviour. Higher education and health insurance ownership show a protective effect with negative coefficients, indicating that increased access to education and health services is associated with a reduced likelihood of smoking. Marital status (married) and urban location were also significant, with married individuals and those residing in urban areas having a higher probability of smoking. Pseudo R² values of approximately 0.397-0.399 indicate that the model has fairly good explanatory power, and statistical significance at the 1% level for almost all core variables reinforces the robustness of these findings. The reported marginal effects provide a practical interpretation of the magnitude of change in the probability of smoking due to a one-unit change in the explanatory variables.

Table 6. Result Robustness Test

Variables	Logistics				Probit			
	Model 5		Model 6		Model 7		Model 8	
	Logistics	Marginal Effect	Logistics	Marginal Effect	Probit	Marginal Effect	Probit	Marginal Effect
<i>Constant</i>	-3.653		-3.209		-1.773		-1.591	
	(0.038)		(0.023)		(0.017)		(0.011)	
<i>age</i>	-0.018	-0.001	-0.022	-0.002	-0.010	-0.002	-0.012	-0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.008)	(0.008)
<i>gender</i>	5.142	0.567	4.734	0.541	2.615	0.567	2.436	0.541
	(0.000)	(0.002)	(0.018)	(0.001)	(0.012)	(0.002)	(0.007)	(0.001)
<i>status</i>	-0.402	-0.028	-0.600	-0.045	-0.215	-0.040	-0.332	-0.062
	(0.019)	(0.001)	(0.012)	(0.001)	(0.011)	(0.002)	(0.007)	(0.001)
<i>educ</i>	-0.872	-0.056	-0.784	-0.059	-0.505	-0.084	-0.448	-0.083
	(0.017)	(0.001)	(0.011)	(0.001)	(0.010)	(0.001)	(0.006)	(0.001)
<i>ins</i>	-0.250	-0.021	-0.190	-0.018	-0.152	-0.032	-0.114	-0.025
	(0.013)	(0.001)	(0.009)	(0.001)	(0.008)	(0.002)	(0.005)	(0.001)
<i>LR chi2</i>		119391.370		246498.030		118884.210		245085.970
<i>Pseudo R2</i>		0.418		0.389		0.416		0.387
<i>Observations</i>		239,527		537,049		239,527		537,049

Note: Standard errors are in parentheses. ***, **, and * denote significance at alpha 1%, 5%, and 10% respectively.

Source: author's calculation (2025).

Table 6 presents the results of the robustness test by dividing the sample into two geographical groups, namely Java (Models 5 and 7) and outside Java (Models 6 and 8). The purpose of this analysis is to test whether the relationship found is stable and independent of specific regional characteristics. The results show that the basic relationship pattern is maintained. Key variables such as gender, education, and health insurance ownership remain significant with the same direction of influence in both regions. Although there is a slight variation in the magnitude of the coefficients – for example, the protective effect of education appears to be slightly stronger in the Java region – this does not change the substantive conclusions. The pseudo R^2 remained relatively high in both subsamples (around 0.387-0.418), indicating that the model still had good explanatory power. The consistency of these results, using both logit and probit methods, in two different regions provides strong support for the validity and reliability of the overall research findings. These findings suggest that the socio-economic and demographic determinants of smoking behaviour in Indonesia are pervasive and apply in various regional contexts.

Discussion

The Increased awareness of healthy living will certainly affect behavior patterns and individual decisions (Hendel et al., 2024). Someone who does not or has not had health insurance is assumed not to have an awareness of healthy living behavior so that they have a greater tendency to engage in risky behavior (Agirdas, 2022). This proves that a person's knowledge and awareness of the consequences arising from cigarette consumption has a considerable influence on individual decisions to consume tobacco cigarettes (Sun et al., 2023).

Smoking becomes commonplace among society, especially for men. Based on data from the Indonesian Ministry of Health (2022), the prevalence of smoking in men is indeed higher compared to the prevalence of smoking in women, namely 62.900 percent for men and 4.800 percent for women. In general, the factors that drive individual decisions to smoke for both men and women do not have significant differences. Peer pressure and the smoking behaviors of friends significantly impact adolescents' choices

to start smoking (Nakaseko et al., 2020). Furthermore, smoking prevalence in women occurs in women with married status, mature age and moderate education (Moradi et al., 2021; Tomioka et al., 2020). As for individuals with separated or divorced status, the probability shown by the odds ratio value is 4.29, which means that individuals with divorced status have a probability of 4.29 times more likely to smoke tobacco than individuals with unmarried status. According to Pengpid et al (2024) stated that, women who are separated, divorced, or widowed are five times more likely to smoke. This is due to greater pressure both from a social and economic perspective which causes increased stress. Kautsar & Nizamie (2021) also states that there is an increase in cigarette consumption in divorced individuals so that divorced individuals have a higher chance of smoking than individuals with married status,

Based on data in the Tobacco Atlas (2020) most individuals start smoking at the age of 15-19 years, where in that age range the average individual is studying at the junior and senior high school level. This is in accordance with this study in which individuals who are studying at the junior and senior high school levels have the greatest odds ratio value. In this study, the education variable seen from the highest education that is being taken has a significant influence on individual decisions to consume tobacco cigarettes. The ability of the individual himself can normatively be measured based on the level of formal education he is currently or has ever taken. The relationship between smoking decisions and individual education levels has been studied several times. Kautsar & Nizamie (2021) which in their research states that, the level of education has a significant influence on cigarette consumption. This is due to the relationship between knowledge, decisions, mindset and behavior with individual education levels. A person with a high level of education will strive to improve the quality of life in order to achieve a better life. The results of the education variable show that the importance of the role of education as an effort to control tobacco cigarette consumption. Although the factors that motivate individuals, especially adolescents, to smoke behavior are very diverse, educational factors have an important role in cigarette control efforts and individual decisions to reduce and even stop smoking so that in this study the level of education has a significant influence on individual decisions to consume cigarettes.

The coefficient of income variables has not influenced decision to consume cigarette. The results of this study are not in line with the research of, which state that income has a significant influence on cigarette consumption (Álvarez et al., 2021). This is also not in line with Keynes' theory which states that every increase of one dollar will increase consumption. Additionally, studies have indicated that while higher income may initially lead to increased smoking, the long-term effects of income changes, such as job loss or economic downturns, can lead to reduced smoking rates as individuals adjust their spending habits (Hummel et al., 2019). Even when spending on food consumption increases, they still choose not to reduce their cigarette consumption. This proves that individual income and individual decisions to smoke do not have a significant influence.

Previous research indicates that households that consume tobacco tend to allocate a smaller portion of their budget to food compared to non-tobacco-consuming households. For instance, a study in Ghana found that tobacco-consuming households exhibited lower food expenditures, raising concerns about potential malnutrition, especially among children, as these households divert a significant portion of their limited income to tobacco products (Masa-Ud et al., 2020; Singh et al., 2020). Similarly, a comparative analysis in Bangladesh highlighted that tobacco use competes with essential household expenditures, resulting in lower food spending among tobacco users, despite their overall higher expenditures on medical items (Husain et al., 2016; Virk-Baker et al., 2019). This competition for resources underscores the crowding-out effect of tobacco expenditures on food budgets.

Moreover, the crowding-out effect is not limited to food alone; it extends to other essential needs such as healthcare and education. Households in poorer socioeconomic brackets often find themselves prioritizing tobacco over basic necessities, which exacerbates health-related inequalities (Kuntz et al., 2016; Magati et al., 2020). For example, a study in South Africa revealed that tobacco and alcohol consumption accounted for a significant portion of household expenditures, thereby limiting funds available for healthier food options (Lloyd-Sherlock et al., 2020). This pattern is consistent across various studies,

which collectively indicate that as tobacco spending increases, the proportion of income allocated to food and other critical areas tends to decrease (Husain et al., 2018; Vladisavljevic et al., 2024). The implications of these spending patterns are profound, particularly concerning child nutrition and overall household health. Research has shown that households with smokers tend to experience higher rates of child malnutrition due to the diversion of funds from food to tobacco (Magati et al., 2020; Webb, 2009). This is particularly alarming in LMICs, where food security is already a pressing issue. The findings suggest that interventions aimed at reducing tobacco consumption could lead to improved dietary patterns and better health outcomes for vulnerable populations (Chelwa & Koch, 2019).

In short, the relationship between tobacco usage and household spending on food is characterized by a significant crowding-out effect, where increased tobacco expenditures lead to reduced food consumption and adverse nutritional outcomes. This dynamic highlights the need for targeted public health strategies that address both tobacco use and food security to improve overall health and well-being in affected households.

The coefficient of asset ownership shows that the probability that individuals who do not have assets are more likely to consume tobacco cigarettes than individuals who have assets. The implications of cigarette expenditure extend beyond individual health, as they also affect household financial stability. Research indicates that tobacco spending can lead to a "crowding-out" effect, where funds that could be used for essential goods and services are diverted to support smoking habits (Chelwa & Koch, 2019). Even when spending on food consumption increases, they still choose not to reduce their cigarette consumption. The ownership of property or assets is not a major factor in the decision to spend on tobacco cigarettes. Addictive substances so that someone who has smoked has a greater chance of continuing to increase their cigarette consumption even though the individual does not have assets and is classified as poor. By employing recent, nationally representative SUSENAS 2020 data and rigorous binary logistic regression, our research provides novel empirical evidence on how healthcare access (via insurance) and economic security (via assets) distinctly shape smoking decisions, offering critical insights for targeted public health interventions in Indonesia.

The most striking divergence from existing literature is the non-significant relationship between income and smoking probability – contradicting Keynesian theory, socioeconomic vulnerability models ((Hustus & Owens, 2018; Nargis et al., 2019), and prior Indonesian research (Kautsar & Nizamie, 2021). This paradox is resolvable only by acknowledging Indonesia's context: extreme cigarette affordability, deep cultural normalization (especially among males), and powerful nicotine addiction create profound price and income inelasticity. As Stinson et al (2020) observed, households prioritize cigarettes over essential needs like food, demonstrating that consumption is driven by compulsion and social habit, not discretionary income. Rising incomes don't increase smoking; instead, smoking crowds out essential expenditures (Husain et al., 2016; Masa-Ud et al., 2020) regardless of income level. This renders traditional income-based policy levers (e.g., expecting progressive taxes to deter low-income smokers via reduced disposable income) less effective in Indonesia compared to settings with weaker tobacco cultures.

A key contribution of this study is elucidating the significant protective effect of health insurance ownership against smoking, even within Indonesia's developing Universal Health Coverage (JKN-BPJS) system. This aligns with Ministry of Health (2020) objectives linking insurance to heightened health awareness and corroborates global findings on insurance enabling healthcare access and risk aversion (Tambe et al., 2021; Zhou et al., 2022). Crucially, our results suggest that in Indonesia, insurance acts not merely as a financial mechanism, but as a catalyst for behavioural change by fostering greater perception of health risks associated with smoking. This finding implies that expanding and strengthening JKN-BPJS coverage, coupled with targeted health literacy campaigns integrated into insurance services, could be a potent, underutilized policy lever for reducing smoking prevalence, particularly among newly enrolled populations.

The results of logistic and probit regression analyses (Table 5) reveal that certain demographic and economic factors have a significant influence on the probability of individuals smoking in Indonesia. The

male gender variable shows the highest positive coefficient, indicating a large gender disparity in smoking behaviour. Meanwhile, higher education, health insurance ownership, and asset ownership act as protective factors with negative coefficients, leading to a decrease in the probability of smoking. Marital status and urban location are also significant with positive effects. The consistency of results between the logit and probit methods, as indicated by the similarity of signs and significance of coefficients and Pseudo R^2 values ranging from 0.397 to 0.399, reinforces the reliability of these findings. Furthermore, a robustness test by dividing the sample into Java and outside Java regions (Table 6) confirmed that the relationship pattern remained stable in both regions, although there were slight variations in the magnitude of the coefficients. This stability, together with the Pseudo R^2 values remaining high in each sub-sample, indicates that the socio-economic and demographic determinants of smoking behaviour are pervasive and apply in various regional contexts in Indonesia.

The empirical findings in this study provide justification and complexity to the proposed theoretical framework. The insignificant effect of income on the probability of smoking is consistent with the postulates of Rational Addiction Theory and behavioural economics, which emphasise the inelastic nature of addictive goods due to the power of habit stock and present bias, where consumption is driven more by compulsive addiction than by rational budget considerations that are sensitive to income. Meanwhile, the function of assets as a protective factor confirms the role of long-term economic stability in expanding the horizon of future planning and reducing vulnerability to addictive behaviour. However, the positive relationship between health insurance ownership and the probability of smoking indicates a more complex mechanism, such as the possibility of reverse causality or selection bias, which obscures the simple causal relationship assumed by the Health Belief Model. Furthermore, extreme gender disparities and patterns related to marital status clearly confirm the hypothesis regarding the central role of sociocultural moderators, such as gender norms and the social function of kretek, which act as powerful nudges in shaping preferences and weakening the effectiveness of price signals and income-based policies.

Implications

The findings carry important implications for both policy and practice in Indonesia's tobacco control efforts. They underscore the need to move beyond uniform excise-based approaches and adopt stratified interventions that address specific demographic and socioeconomic vulnerabilities. Expanding access to health insurance – particularly through the national JKN-BPJS system – should be leveraged as a platform for integrating smoking prevention and cessation services, coupled with targeted health literacy campaigns. Simultaneously, social protection and asset-building programs can enhance economic resilience, potentially reducing stress-induced smoking among low-asset households. Education campaigns must be tailored across life stages and genders, while regulatory measures – such as stricter age limits and tighter control on cigarette accessibility – should be enforced through multisectoral collaboration. Ultimately, this study advocates for a holistic policy framework that combines financial security, healthcare access, and behavioral change initiatives to effectively reduce tobacco consumption in Indonesia.

Conclusion

This study concludes that in Indonesia, demographic factors – particularly age, gender, marital status, and education level – as well as economic security indicators such as health insurance and asset ownership, show a significant association with an individual's probability of consuming tobacco cigarettes. The findings indicate that health insurance and asset ownership are associated with a lower likelihood of smoking, while income does not show a significant effect. This reinforces the proposition that smoking behaviour is more closely related to addictive properties and socio-cultural norms than to current income. It is important to emphasise that this interpretation is associative, and the cross-sectional data used does not allow for causal conclusions or proof of underlying mechanisms (e.g., whether insurance

increases health awareness or asset ownership reduces economic stress, which then influences smoking decisions). The resulting policy implications remain relevant, namely the need for tobacco control strategies that go beyond fiscal instruments by strengthening age-based regulations, expanding public education, and supporting community-based smoking cessation efforts. Further research is needed to explore the causal pathways linking health insurance and asset ownership to smoking decisions, as well as their interaction with traditional factors, to develop more effective and equitable public health strategies in Indonesia and similar contexts.

Limitations for Further Research

This study acknowledges several limitations that should be addressed in future research. First, the cross-sectional design of the SUSENAS 2020 data restricts the ability to infer causal relationships between the examined factors and smoking behavior. Second, self-reported data on tobacco consumption may be subject to recall or social desirability bias. Third, while health insurance and asset ownership were included as novel variables, other potential determinants – such as psychological stress, peer influence, cultural norms, and regional tobacco control enforcement – were not captured. Additionally, the study focuses solely on individual-level factors; future research could incorporate macro-level variables such as local tobacco advertising exposure or community-level smoking prevalence. Finally, the generalizability of findings may be limited to contexts like Indonesia, and further validation in other low- and middle-income countries is recommended.

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