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Contextual Effect of Village, Implementation of Theory of Planned Behavior, and Decision to Quit Smoking: A Multilevel Analysis

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ABSTRACT

Background: Behavior is determined by the intention to perform a behavior. Intentions are further influenced by three constructs, attitudes (the advantages and disadvantages of engaging in a behavior), subjective norms (social influences on a behavior) and perceived behavioral control (facilitators and barriers to a behavior). The study aimed to analyze the contextual influence of the hamlet on the application of the Theory of Planned Behavior (TPB) construct in the decision to stop smoking among adults in Surakarta.
Subjects and Method: A cross-sectional study was conducted in 22 villages in Surakarta in November-December. A sample of 200 adult smokers and quitters was selected using snowball sampling. The dependent variable is the decision to stop smoking. The independent variables are intention, attitude, subjective norm, and perceived behavioral control. Data were collected by questionnaire and analyzed using multilevel multiple linear regression.
Results: A person's decision to stop smoking is directly influenced by the intention to stop smoking (b= 0.18: 95% CI= 0.07 to 0.28; p= 0.001). Intention to quit smoking was significantly influenced by attitudes about smoking (b= 0.21: 95% CI= 0.10 to 0.32; p <0.001), subjective norms (b=0.19: 95% CI= 0.06 to 0.32; p= 0.003), and perception behavioral control (b= 0.25: 95% CI= 0.09 to 0.42; p= 0.002). Variations at level 2 hamlets have a contextual relationship to the decision to stop smoking (ICC= 10.43%).
Conclusion: Decision to quit smoking is directly influenced by the level of intention to quit smoking. Intention to quit smoking itself is influenced by attitudes, subjective norms, and perceived behavioral control. Hamlet has a contextual effect on the decision to quit smoking.

Keywords: multilevel analysis, theory of planned behavior, decision to stop smoking.

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BACKGROUND

The Theory of Planned Behavior (TPB) can predict risk factors that influence the decision not to smoke. This concept argues that a person's behavior is influenced by intentions that arise from attitudes, perceived

social norms, and perceptions regarding control over the behavior itself (Droomers et al, 2016).

According to the Theory of Planned Behavior (TPB) behavior is determined by the intention to carry out a behavior. Intentions are further influenced by three constructs, attitudes (the advantages and disadvantages of engaging in a behavior), subjective norms (social influences on a behavior) and perceived behavioral control (facilitators and barriers to a behavior). The TPB has been used widely to identify factors that influence intentions and explain the cognitive processes underlying smoking and to examine smoking cessation behavior (Doherty et al., 2022).

Based on scientific evidence that has been collected by the Framework Convention of Tobacco Control, the World Health Organization has concluded that the only proven effective way to protect public health from the harmful effects of tobacco smoke, including passive tobacco smoke, is to implement a 100% smoke-free environment policy. This smoke-free environmental policy not only protects the health of non-smoking individuals, but has also proven popular because it does not harm business and can provide encouragement for smokers to quit smoking. Apart from that, WHO also stipulates graphic message warnings, restrictions on tobacco advertising and the establishment of tobacco taxes (World Health Organization, 2022).

According to WHO (Wold Health Organization) 2022 Tobacco kills half of its users, tobacco kills more than 8 million people every year and more than 7 million of these deaths are the result of direct tobacco use, while 1.2 million are the result of non-smokers being exposed to cigarette smoke other people (World Health Organization, 2022). The WHO global action plan for the prevention and control of non-communicable diseases 2013–2020 has set a target of reducing the prevalence of tobacco use by 30% among individuals aged 15 years or older between 2010 and 2025 (Ma et al., 2021).

The prevalence of smoking among people aged over 15 years in Indonesia fluctuates every year. In 2007, the Riskesdas result was 34.2%. 2010 showed an increase with a figure reaching 34.4%. Riskesdas 2013 revealed a more significant increase with smoking prevalence reaching 36.3%. In 2016 the National Health Service recorded a decrease in smoking prevalence to 32.8%. In 2018, Riskesdas showed that the prevalence of smoking increased to 33.8% (Ministry of Health, 2018).

From this background and problems, the aim of this research is to analyze the contextual influence of the hamlet on the application of the Theory of Planned Behavior (TPB) construct in the decision to stop smoking among adults in Surakarta, Indonesia.

SUBJECTS AND METHOD

1. Study Design

This was a cross sectional study conducted at 22 hamlets in Surakarta, from November to December 2023.

2. Population and Sample

The study population was people who smoked and quit smoking. The number of samples was taken based on snowball sampling of 22 hamlets in 4 sub-districts. The total sample was 200 persons.

3. Study Variables

The dependent variable was the decision to stop smoking. The independent variables were intention, attitude, subjective norms, and perceived behavioral control.

4. Operational Definition of Variables

Quit Smoking Decision: Action taken by a person to stop smoking.

Intention: A person's desire to quit smoking that originates within the individual.

Attitude: Feelings of support or partiality or feelings of impartiality towards an object (quitting smoking) that will be addressed.

Subjective Norms: A person's perception of social pressure or a number of people who are considered important for quitting smoking.

Perceived Behavioral Control: A person's perception of smoking cessation.

5. Study Instruments

The data were collected using a set of questionnaire. It had been tested for validity and reliability.

6. Data analysis

Univariate analysis was conducted to describe frequency distribution of sample characteristics. Chi square test was implemented to examine the effect of each exposures on outcome independently. Multivariate analysis was carried out using a multilevel linear regression model.

7. Research Ethics

Research ethics including informed consent, anonymity, and confidentiality, were handled carefully throughout the research process. The information that has been collected by researchers will comply with predetermined research ethics including a letter of approval for research ethics permission obtained from the Research Ethics Committee of RSUD Dr. Moewardi city of Surakarta No. 1.953/X/HREC/2023.

RESULTS

1. Sample Characteristics

Table 1 shows the results of the ages of research subjects with a total of 200 people, showing results (Mean= 38.235, SD= 11.02) with the youngest was 21 years old and the oldest was 62 years old. Mean of income was 1,808,250 Rupiah (SD= 1,236,035 Rupiah).

Table 1. Sample characteristics (Continous data).

Variables	n	Mean	SD	Min.	Max.
Age (years old)	200	38.24	11.02	21	62
Income (Rupiah)	200	1,808,250	1,236,035	0	5,000,000

2. Univariate analysis

Univariate analysis is a data analysis technique that focuses on one variable without paying attention to its relationship with other variables. The main goal of univariate analysis is to understand and describe a single characteristic or behavior of a variable.

Table 2 showed the results of 200 research subjects on the decision variable to stop smoking with the smoking cessation category being 124 research subjects (62%). There were 100 strong intentions to stop smoking, namely 100 research subjects, and 100 research subjects with weak intentions to stop smoking, so each (50%). The attitude towards quitting smoking was dominated by a positive attitude towards the decision to quit smoking for 129 research subjects (64.50%). There were 109 research subjects (54.50%) with strong subjective norms, while there were 91 research subjects (45.50%) with weak subjective norms. The perception of strong behavioral control was 117 research subjects (58.50%).

Table 2. Results of univariate analysis of smoking cessation decisions, intentions, attitudes, subjective norms, and perceived behavioral control.

Variable	Category	Frequency (n)	Percentage (%)
Decision to Quit Smoking	Smoke	76	38.00
	Quit smoking	124	62.00
Intention	Weak	100	50
	Strong	100	50
Attitude	Negative	71	35.50
	Positive	129	64.50
Subjective Norms	Weak	91	45.50
	Strong	109	54.50
Perceived Behavioral Control	Weak	83	41.50
	Strong	117	58.50

3. Bivariate Analysis

Bivariate analysis was carried out to determine the effect of one independent variable on the dependent variable using the Chi Square test. The results of the bivariate analysis test in this study were carried out to determine whether there was an influence of the theory of planned behavior construct on the decision to stop smoking.

Table 3 shows that 79% of adults have a strong intention not to smoke, while around 21% of them still smoke. The results of the chi square analysis test show that there is a significant influence between strong intentions and the decision to stop smoking with a value of (OR= 2.72; 95% CI= 1.36 to 5.44; p= 0.005). These results show that there is an influence and it is statistically significant. So it can be interpreted that someone with a strong intention to stop smoking has the opportunity to stop smoking 2.72 times compared to someone with a weak intention.

Table 3 shows that 73.6% of adults have a positive attitude towards the decision to stop smoking, while 26.3% of them continue to smoke even though they have a positive attitude. It was found that there was a significant influence between a positive attitude and the decision to stop smoking with a value (OR= 1.82; 95% CI= 0.88 to 3.74; p= 0.002). These results show that there is an influence and it is statistically significant. So it can be interpreted that someone with a positive attitude towards quitting smoking has a 1.82 times chance of quitting smoking compared to someone with a negative attitude.

Table 3 showed that subjective norms are strong in the decision to stop smoking as much as 78%, while 22% of them still smoke. It was found that there was a significant influence between strong subjective norms and the decision to stop smoking with value (OR= 2.94; 95% CI= 1.47 to 5.87; p= 0.002). These results show that there is an influence and it is statistically significant. So it can be interpreted that someone with a strong subjective norm to stop smoking has a chance of quitting smoking 2.94 times compared to someone with a weak subjective norm.

Table 3 shows that the perception of strong behavioral control is reflected in the decision to stop smoking as much as 77.7%, while 22.2% still continue to smoke. It was found that there was a significant influence between strong subjective norms and the decision to stop smoking with value (OR= 3.36; 95% CI= 1.68 to 6.69; p= 0.001). These results show that there is an influence and it is statistically significant. So it can be interpreted that someone with a strong perception of behavioral control to

stop smoking has a 3.36 times chance of quitting smoking compared to someone with a weak perception of behavioral control.

Table 3. Results of bivariate analysis of the influence of intentions, attitudes, subjective norms, and perceived behavioral control on the decision to stop smoking

Independent variables	Decision to stop smoking				Total		OR	95% CI		p
	Smoking		Quit Smoking					Lower Limit	Upper Limit	
	n	%	n	%	n	%				
Intention										
Weak	55	55	45	45	76	100	2.72	1.36	3.44	0.005
Strong	21	21	79	79	124	100				
Attitude										
Negative	42	59.1	29	40.8	71	100	1.82	0.88	3.74	0.002
Positive	34	26.3	95	73.6	129	100				
Subjective norms										
Weak	52	57.1	39	42.8	91	100	2.94	1.47	5.87	0.002
Strong	24	22	85	78	109	100				
PBC										
Weak	50	60.2	33	39.7	83	100	3.36	1.68	6.69	0.001
Strong	26	22.2	91	77.7	117	100				

4. Multivariate analysis

a. Intention and Decision to Quit Smoking

Table 4 shows that there is a positive and statistically significant relationship between the intention to stop smoking and the decision to stop smoking. Every increase in intention score will be followed by an increase in the decision to quit smoking score by 0.18 (b=0.18: 95% CI; 0.07 to 0.28; p= 0.001).

b. Attitudes and Decisions to Quit Smoking

Table 4 shows that there is a positive and statistically significant relationship between attitudes and the decision to stop smoking. Every one unit increase in the attitude score will be followed by an increase in the decision to stop smoking score by 0.21 units (b= 0.21: 95% CI; 0.10 to 0.32; p<0.001).

c. Subjective Norms and the Decision to Quit Smoking

There is a positive relationship between subjective norms and the decision to stop smoking. Every one unit increase in the subjective norm score will be followed by an increase in the decision to stop smoking score by 0.19 units (b= 0.19: 95% CI; 0.06 to 0.32; p= 0.003) (Table 4).

d. Perceived Behavioral Control and the Decision to Quit Smoking

Table 4. shows that there is a positive and statistically significant relationship between perceived behavioral control and the decision to stop smoking. Every one unit increase in the perceived behavioral control score will be followed by an increase in the decision to stop smoking score by 0.25 units (b= 0.25: 95% CI; 0.09 to 0.42; p= 0.002).

e. Suitability of Multilevel Analysis Models

Table 4 shows that the multilevel analysis model is statistically significantly different from the ordinary linear regression model (p=0.011). Dukuh provides quite a large contextual influence on the decision to stop smoking with ICC= 10.43% > 8-10%.

Table 4. Multilevel logistic regression results of the influence of intentions, attitudes, subjective norms, and perceived behavioral control on the decision to stop smoking

Independent Variable	Regression coefficient b	CI 95%		p
		Lower Limit	Upper Limit	
Fixed Effect				
Intention	0.18	0.07	0.28	0.001
Attitude	0.21	0.10	0.32	<0.001
Subjective Norms	0.19	0.06	0.32	0.003
Perceived Behavioral Control	0.25	0.09	0.42	0.002
Random Effect				
Hamlet				
Variation (constant)	0.21	0.06	0.74	
N observations = 200				
N groups= 22				
Group mean= 9.1, min=4, max=17				
LR test vs. linear model:				
chi^2= 5.30				
p= 0.011				
Intra Class Corelation (ICC)= 10.43%				

DISCUSSION

According to the Theory of Planned Behavior (TPB), behavioral intentions are determined by three factors: attitudes toward the behavior, subjective norms regarding the behavior, and perceived behavioral control. In the current formulation of the theory, supportive attitudes and positive subjective norms provide the motivation to engage in behavior, but concrete intentions to do so are only formed when perceived control over the behavior is strong enough (Ajzen, 2005).

The results of multilevel logistic regression analysis show that there is a positive and statistically significant relationship between the intention to quit smoking and the decision to quit smoking. Every increase in one intention score will be followed by an increase in the decision to quit smoking score by 0.18 (b=0.18: CI95%= 0.07 to 0.28; p= 0.001).

Lee et al. (2022) explained that the most effective factor for quitting smoking is the smoker's voluntary intention to quit, and the intention to quit smoking is a prerequisite for any preparation and practice of quitting smoking. In addition, according to the theory of planned behavior, the determining factor in quitting smoking is the intention to stop smoking. Therefore, to implement effective smoking cessation policies, authorities must understand smoking cessation intentions among smokers (Lee et al., 2022)

The results of multilevel logistic regression analysis show that there is a positive and statistically significant relationship between attitudes and the decision to stop smoking. Every one unit increase in the attitude score will be followed by an increase in the decision to stop smoking score by 0.21 units (b=0.21: 95% CI= 0.10 to 0.31; p=<0.001).

Pang et al. (2023) verified that attitude has a positive correlation with smoking cessation behavior. As verified by the TPB, positive attitudes towards smoking cessation directly influence smoking cessation behavior (Pang et al., 2023). This conclusion is consistent with the results of previous research, namely Sabzmakan et al (2018). Therefore, when trying to guide smokers to quit smoking, it is necessary to strengthen smokers' personal self-protection awareness. This can be achieved by focusing on guiding and shaping changes in smokers' attitudes towards the severe consequences of smoking (Sabzmakan et al., 2018).

The results of multilevel logistic regression analysis show that there is a positive and statistically significant relationship between subjective norms and the decision to stop smoking. Every one unit increase in the subjective norm score will be followed by an increase in the decision to stop smoking score by 0.20 units (b=0.20: CI95%= 0.06 to 0.32; p= 0.005).

Research by Zhao et al. (2019) shows that subjective norms play an influential role in the model with the highest coefficient. Within the framework of the Theory of Planned Behavior, subjective norms have an important role in shaping intentions and behavior (Zhao et al., 2019). If subjective norms favoring smoking cessation are strong, it can increase the likelihood that a person has a strong intention to quit and ultimately encourage them to take concrete steps to achieve that goal. Conversely, if subjective norms tend to favor the continuation of smoking behavior, it may become an obstacle for someone trying to quit.

The results of multilevel logistic regression analysis show that there is a positive and statistically significant relationship between perceived behavioral control and the decision to stop smoking. Every one unit increase in the perceived behavioral control score will be followed by an increase in the decision to stop smoking score of 0.32 units (b=0.32: 95% CI= 0.15 to 0.48; p=<0.001).

Tseng et al. (2018) states that an individual's attitude of control and perception of smoking cessation behavior has a significant direct impact on their desire to stop smoking. Smoking cessation promotion initiatives that focus on strengthening individuals' beliefs about quitting smoking, increasing individuals' perceptions of their ability to quit smoking, and convincing them that they can overcome existing barriers to the smoking cessation process can increase the effectiveness of such smoking cessation interventions (Tseng et al., 2018). This is also supported by research by Zhao et al 2022. Perceived Behavioral Control continues to show a relationship with smoking behavior and intentions. Another striking construct is attitude. The important role of Perceived Behavioral Control suggests that activities that strengthen smokers' self-efficacy can produce beneficial outcomes (Zhao et al., 2022).

AUTHOR CONTRIBUTION

The authors have made significant contributions to data analysis as well as preparing the final manuscript.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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