Jurnal Riset Bisnis Vol 9 (2) (April 2026) hal: 281 – 300
e - ISSN 2598-005X p - ISSN 2581-0863
e-jurnal: http://journal.univpancasila.ac.id/index.php/jrb/

FACTORS INFLUENCING ATTITUTES AND INTENTIONS TO PURCHASE SUNSCREEN PRODUCTS AMONG MALE MINE WORKERS IN INDONESIA

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Diterima 17 Februari 2026, Disetujui 9 April 2026, Terbit 30 April 2026

Abstrak

Pekerja tambang pria merupakan kelompok dengan paparan radiasi ultraviolet (UV) tertinggi sehingga berisiko mengalami sunburn, hiperpigmentasi, penuaan dini, hingga kanker kulit. Namun, tingkat penggunaan sunscreen pada kelompok ini masih rendah akibat persepsi bahwa produk tersebut tidak penting, kurang praktis, dan tidak sesuai dengan lingkungan kerja. Penelitian ini bertujuan menganalisis faktor-faktor yang memengaruhi sikap dan niat beli sunscreen dengan mengintegrasikan Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), serta Perceived Behavioral Control dari Theory of Planned Behavior (TPB). Pendekatan kuantitatif digunakan melalui survei terhadap pekerja tambang pria di berbagai lokasi tambang terbuka di Indonesia dengan teknik purposive sampling. Data dianalisis menggunakan pendekatan korelasional untuk menguji hubungan antarvariabel dalam model teoritis. Hasil penelitian menunjukkan bahwa Perceived Physical Benefits, Subjective Norm, Perceived Ease of Use, dan Perceived Behavioral Control berpengaruh signifikan terhadap sikap, yang selanjutnya meningkatkan niat beli sunscreen. Studi ini menyimpulkan bahwa peningkatan persepsi manfaat, kemudahan penggunaan, dan dukungan sosial merupakan kunci dalam mendorong adopsi sunscreen sebagai bagian dari budaya keselamatan kerja di lingkungan pertambangan.

Kata kunci: pekerja tambang pria; tabir surya; paparan radiasi ultraviolet

Abstract

Male mine workers represent one of the occupational groups with the highest exposure to ultraviolet (UV) radiation, placing them at significant risk of sunburn, hyperpigmentation, premature aging, and skin cancer. Despite these risks, sunscreen usage among this group remains low due to perceptions that it is unimportant, impractical, and unsuitable for the work environment. This study aims to analyze the factors influencing attitudes and purchase intention toward sunscreen by integrating the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and Perceived Behavioral Control from the Theory of Planned Behavior (TPB). A quantitative approach was employed through a survey of male mine workers across various open-pit mining sites in Indonesia using purposive sampling. Data were analyzed using a correlational approach to examine the relationships among variables within the proposed theoretical model. The findings indicate that Perceived Physical Benefits, Subjective Norm, Perceived Ease of Use, and Perceived Behavioral Control significantly influence attitude, which in turn positively affects purchase intention. The study concludes that enhancing perceived benefits, usability, and social support is crucial in promoting sunscreen adoption as part of occupational safety culture in mining environments.

Key words: *male mine workers; sunscreen purchase intention; attitude toward behavior; perceived behavioral control; ultraviolet exposure; health behavior*

INTRODUCTION

Mine workers are a high-risk occupational group for solar ultraviolet radiation exposure due to prolonged outdoor working conditions, which may increase the risk of adverse skin and eye health outcomes, including non-melanoma skin cancer (Ramotsehoa et al., 2024). This condition demands adequate skin protection behavior, which is influenced by the psychological and social aspects of individuals when making decisions about using skin protection products. Attitudes and intentions to use personal care products are understood as the result of the interaction between individual beliefs, social norms, and perceptions of the product's benefits. Nevertheless, existing studies on sunscreen use and personal care product adoption have largely focused on general consumers or urban populations, and only a limited number have examined high-risk occupational groups with prolonged outdoor exposure. Moreover, prior research has not sufficiently integrated perceived risk, perceived ease of use, and perceived behavioral control in a single framework when explaining sunscreen-related attitudes and purchase intentions. These variables are particularly critical in the mining context, where physically demanding work conditions, time constraints, and workplace regulations may significantly shape preventive health behavior

In line with the growing awareness of sun-related health risks, the sun protection skin care industry in Indonesia has shown a steady growth trend. According to Statista Market Insights, revenue from the sun protection skin care market in Indonesia has increased consistently since 2018 and is projected to continue rising through 2030, reaching several hundred million U.S. dollars. This growth reflects increasing public awareness of UV exposure risks and the expanding market potential for sunscreen products in Indonesia. However, the expansion of the sunscreen market does not necessarily translate into optimal adoption among high-risk occupational groups such as mine workers, who face unique structural, perceptual, and behavioral barriers to sunscreen use. Therefore, this study offers novelty by addressing both a practical knowledge gap and a population gap. First, it integrates the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and the Theory of Planned Behavior (TPB) to provide a more comprehensive explanation of sunscreen purchase intention by simultaneously incorporating personal beliefs, product-related perceptions, and perceived control factors. Second, it focuses specifically on male mine workers in Indonesia, a high-risk yet under-researched population whose occupational environment presents unique behavioral and structural challenges. By doing so, this study distinguishes itself from previous research and contributes new empirical insights to the literature on health-protective behavior in occupational safety contexts.

A previous study by Simanjuntak et al. (2025) showed that Health Care, Perceived Physical Benefits, Aging Effect, and Subjective Norm are important variables in shaping attitudes and intentions to use personal care products based on the Theory of Reasoned Action (TRA). However, the context of mine workers differs significantly from that of general personal care product consumers.

Weig et al. (2019) stated that challenges such as concerns about irritation, stickiness, impracticality of use in the field, and the perception that sunscreen is a "women's product" are closely related to the variables Perceived Risk and Perceived Ease of Use, as explained in the Technology Acceptance Model (TAM).

Keurentjes et al. (2022) found that sunscreen use behavior is heavily influenced by structural factors such as product availability on site, the opportunity to apply sunscreen before working, and support from the company's OHS policies. These factors are part of Perceived Behavioral Control (PBC), which is an important component of the Theory of Planned Behavior (TPB) (Jeong & Lee, 2021).

Therefore, understanding sunscreen use behavior among mine workers requires an integration of more comprehensive behavioral theories, encompassing personal, social, perceptual, and situational factors unique to the mining industry.

Based on the literature review, there are two main research gaps that form the basis of this study:

(1) Practical Knowledge Gap. Research on the purchasing behavior of personal care products, including sunscreen, has not simultaneously addressed the variables Perceived Risk, Perceived Ease of Use, and Perceived Behavioral Control. These three variables are highly relevant in the context of male mine workers who face physical and psychological challenges in using sunscreen. (2) Population Gap. There is no empirical research specifically investigating the factors that shape attitudes and intentions regarding sunscreen use among male mine workers in Indonesia, a high-risk group with work environments continuously exposed to UV radiation.

Based on these phenomena, this study aims to analyze the factors that influence attitudes and purchase intentions regarding sunscreen among male mine workers in Indonesia, using sunscreen as a skin protection effort.

LITERATURE REVIEW

The Theory of Reasoned Action (TRA) explains that a person's behavioral intention is determined by two main components: Attitude Toward Behavior and Subjective Norm (Sussman & Gifford, 2019). Attitude Toward Behavior is the positive or negative evaluation of a behavior, while Subjective Norm reflects the individual's perception of social pressure or support from important others (Yadav & Pathak, 2017). This theory emphasizes that individuals make decisions rationally by considering the

consequences of their actions and social views before engaging in a behavior.

In the context of sunscreen use among mine workers, The Theory of Reasoned Action (TRA) is relevant because the intention to use sunscreen is strongly influenced by two factors: (1) how much the worker perceives sunscreen as beneficial for protecting the skin, and (2) the social support from coworkers, supervisors, and the prevailing habits within the mining environment (Sussman & Gifford, 2019). Given the masculine work culture and low awareness of skin care, social norms play a crucial role in shaping the intention to use sunscreen (Adam et al., 2021). The Technology Acceptance Model (TAM) is an extension of TRA that focuses on the acceptance of innovations based on perceived benefits and ease of use (Venkatesh et al., 2016). TAM highlights two main variables that influence behavioral intention: (1) Perceived Ease of Use (PEU), the belief that a product is easy to use, non-intrusive, and comfortable to apply (Weig et al., 2019), (2) Perceived Risk (PR), an individual's perception of potential drawbacks, such as skin irritation, stickiness, discomfort, or doubts about the product's effectiveness (Hotman et al., 2015)

In the context of male mine workers, sunscreen is often perceived as impractical, sticky, or uncomfortable to use in a work environment that is hot, dusty, and physically demanding (Weig et al., 2019). These psychological and functional barriers make TAM relevant for explaining their attitudes toward sunscreen use.

The Theory of Planned Behavior (TPB) as an extension of TRA, adds the variable Perceived Behavioral Control (PBC). PBC reflects the extent to which an individual feels capable and has the resources to perform a behavior.

Jeong & Lee (2021) demonstrated that Attitude Toward Behavior, Subjective Norm, and Perceived Behavioral Control all significantly influence health behavioral intentions, particularly in the context of preventive behaviors. PBC becomes an important variable because health behaviors heavily depend on an individual's ability to access resources, time, organizational support, and comfort in performing the behavior.In the context of mine workers in Indonesia, Perceived Behavioral Control is highly relevant, as the intention to purchase and use sunscreen can be influenced by the availability of sunscreen at the worksite, the company's policies on UV protection, and the workers' ability and opportunity to apply it before and during work.

Thus, Perceived Behavioral Control complements this research model by explaining the factors of ability and control that may either hinder or facilitate workers in purchasing and using sunscreen.

Sunscreen use behavior is shaped by Attitude Toward Behavior and Subjective Norm (TRA), Perceived Ease of Use and Perceived Risk (TAM), as well as Perceived Behavioral Control (TPB). These three theories complement

each other and form a strong theoretical foundation for developing a behavior model for sunscreen use among male mine workers in Indonesia (Bosnjak et al., 2020).

Hypothesis

Drawing on the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and the Theory of Planned Behavior (TPB), this study assumes that attitudes and purchase intention toward sunscreen among male mine workers are formed through a combination of personal beliefs, product-related perceptions, social influence, and perceived control over behavior. In high-risk and physically demanding mining environments, workers are likely to evaluate sunscreen not only based on health-related considerations, but also on its practical suitability for daily work routines, perceived risks, and the extent of organizational and social support. Therefore, attitudes toward sunscreen use are expected to be shaped by health care orientation, perceived physical benefits, aging effect awareness, perceived risk, perceived ease of use, and subjective norms, while purchase intention is further determined by attitude toward behavior and perceived behavioral control.

Based on the theoretical framework of the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and the Theory of Planned Behavior (TPB), as well as findings from prior studies on sunscreen use and health-protective behavior, this study develops eight hypotheses to examine the factors influencing attitudes and purchase intention toward sunscreen among male mine workers in Indonesia.

H1: **Health Care positively influences Attitude Toward Behavior in sunscreen use among male mine workers in Indonesia.**

Attitudes toward a behavior are shaped by an individual's beliefs about the consequences of that behavior. In the context of sunscreen use, **health care** reflects mine workers' awareness of the importance of skin health and the belief that using sunscreen provides positive benefits. The higher the individual's awareness of skin health and personal responsibility in protecting the skin from sun exposure, the more positive the attitude toward using sunscreen will be (Glanz et al., 2015). Therefore, this study hypothesizes that health care positively influences attitude toward behavior in sunscreen use (Simanjuntak et al., 2025).

H2: Perceived Physical Benefits positively influence Attitude Toward Behavior in sunscreen use among male mine workers in Indonesia.

An individual's perception of the physical benefits derived from using sunscreen plays a crucial role in shaping attitudes toward that behavior. Mine workers who believe that sunscreen can prevent skin damage, maintain skin condition, and help repair or restore skin health are more likely to view sunscreen use as a beneficial and relevant action (Felton et al., 2016). The direct and tangible physical benefits perceived by individuals provide a strong justification for positively evaluating the behavior of using sunscreen (White et al., 2019). Therefore, the stronger the workers' perception of

the physical benefits of sunscreen, the more positive their attitude toward using sunscreen will be (Li et al., 2021).

H3: Aging Effect positively influences Attitude Toward Behavior in sunscreen use among male mine workers in Indonesia.

An individual's awareness of the premature aging effects caused by ultraviolet exposure plays a role in shaping attitudes toward sunscreen use (Horsham et al., 2020). Mine workers who believe that sunscreen can help keep their skin youthful, delay the aging process, reduce wrinkles and dark spots, and maintain a youthful appearance are more likely to view sunscreen use as a valuable and beneficial behavior. The perception of long-term protection benefits encourages individuals to evaluate sunscreen use more positively (Li et al., 2021). Therefore, the higher the awareness of sunscreen's benefits in reducing premature aging effects, the more positive the attitude toward sunscreen use will be (Vuong et al., 2023).

H4: Perceived Risk negatively influences Attitude Toward Behavior in sunscreen use among male mine workers in Indonesia.

Perceived risk refers to mine workers' concerns about the potential drawbacks of using sunscreen, such as skin irritation, stickiness, discomfort, inconvenience during work, doubts about effectiveness, and perceived interference with work activities. In the Technology Acceptance Model (TAM), perceived risk and perceived barriers can reduce favorable evaluations of a product and weaken users' willingness to adopt it, particularly when the product is viewed as incompatible with routines or as introducing additional effort and discomfort. In mining environments characterized by heat, dust, sweating, and physically demanding tasks, such concerns may become more salient and contribute to a negative evaluation of sunscreen use. Therefore, the higher the perceived risk associated with sunscreen use, the more negative the attitude toward using sunscreen will be among male mine workers. (Sheeran et al., 2017).

H5: Perceived Ease of Use positively influences Attitude Toward Behavior in sunscreen use among male mine workers in Indonesia.

Perceived ease of use refers to the extent to which male mine workers perceive sunscreen as easy to use, applicable across various working conditions, and usable skillfully without difficulty. In the Technology Acceptance Model (TAM), ease of use is a critical determinant of individuals' favorable evaluations of a product, particularly when it supports efficiency and does not disrupt established routines. Male mine workers who believe that sunscreen is easy to use, can be applied in various conditions, and can be used skillfully without difficulty are more likely to form a more positive evaluation of sunscreen use behavior (Zhang et al., 2019). Ease of use becomes an important consideration in work environments that demand efficiency and comfort. Therefore, the higher the perceived ease of use of sunscreen, the more positive the attitude toward sunscreen use will be (Zhao et al., 2018)

H6: Attitude Toward Behavior positively influences Intention to Use sunscreen among male mine workers in Indonesia.

Male mine workers who view purchasing and using sunscreen as a smart, positive, and wise decision are more likely to have a stronger inclination to engage in this behavior in the future. A positive attitude serves as a motivational foundation that encourages individuals to actualize sunscreen use behavior by translating favorable evaluations into behavioral intention (Sniehotta et al., 2019). In line with the Theory of Reasoned Action and the Theory of Planned Behavior, attitude toward a behavior is positioned as a proximal determinant of intention. Therefore, the more positive male mine workers' attitude toward using sunscreen, the higher their intention to purchase and use sunscreen will be (Bosnjak et al., 2020).

H7: Subjective Norm positively influences Attitude Toward Behavior in sunscreen use among male mine workers in Indonesia.

Male mine workers who perceive that important people around them, such as coworkers or supervisors, support the use of sunscreen are more likely to develop a positive attitude toward this behavior (White et al., 2019). Social approval helps sunscreen use to be seen as appropriate and acceptable in the work environment. When sunscreen use is considered a normal practice, individuals tend to evaluate the behavior more favorably (Farrow et al., 2017). Therefore, stronger subjective norms are expected to positively influence attitudes toward sunscreen use among male mine workers in Indonesia.

H8: Perceived Behavioral Control positively influences Purchase Intention for sunscreen among male mine workers in Indonesia.

Perceived behavioral control reflects an individual's confidence in their ability, resources, and opportunities to use sunscreen, indicating the extent to which the behavior can be realistically carried out in daily life (Hamilton et al., 2017). Male mine workers who feel they have sufficient time, financial capacity, and adequate information regarding how to use sunscreen are more likely to develop a stronger intention to purchase sunscreen (Shmueli, 2021). In accordance with the Theory of Planned Behavior, when individuals perceive a higher level of control over performing a behavior, their intention to engage in that behavior increases. Therefore, the higher the perceived behavioral control, the higher the intention to purchase and use sunscreen among male mine workers.

Figure 1 presents the research model and the proposed hypotheses.

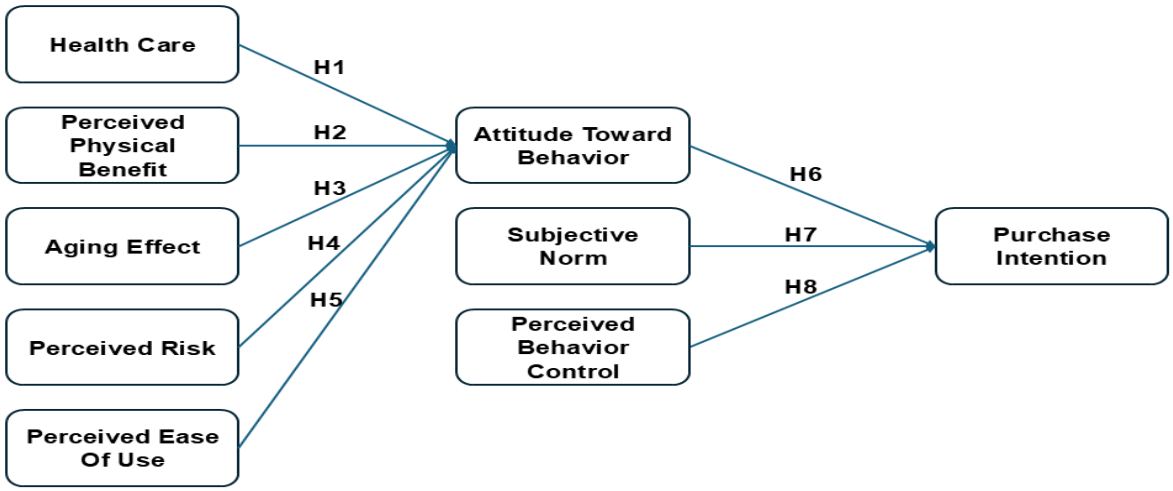


Figure 1. The Research model
Sources : Data Processing Results

This study uses a descriptive correlational quantitative approach, which aims to describe the characteristics of respondents and examine the relationships between research variables based on the TRA, TAM, and TPB theoretical frameworks. The correlational approach is chosen to identify and analyze the strength and direction of the relationships between personal, social, risk, ease of use, attitude, and intention factors concerning sunscreen use behavior among male mine workers.

The study is conducted cross-sectionally, where data is collected at a specific point in time. The survey technique is chosen as the primary data collection method because it is suitable for obtaining information on behaviors, perceptions, and attitudes from a large population spread across several mining locations in Indonesia.

The population in this study consists of male field workers in the open-pit mining industry across Java, Kalimantan, Sumatra, Sulawesi, and Papua. This group is selected due to their high exposure to ultraviolet (UV) radiation as a result of working entirely in open areas, making them relevant to the research objective of understanding the factors influencing sunscreen use as a skin protection effort.

The sampling technique used is non-probability sampling with a purposive sampling approach. This technique is chosen considering the very specific characteristics of the population, which is not easily accessible through random sampling due to the scattered work locations and limited access in the mining areas.

The minimum sample size is set at 250 respondents, in accordance with recommendations for multivariate quantitative research that requires a sufficiently large number of respondents to obtain stable parameter estimates and improve statistical analysis accuracy. This number also allows the researcher

to examine relationships between variables more reliably in a research model involving multiple constructs. Thus, this sampling technique is considered appropriate to generate data that is representative of the male mine worker population targeted in the study.

The measurement of variables in this study was conducted using a questionnaire instrument that was developed based on adaptations from previous relevant studies related to the Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM). All conceptual variables in this study were measured using a five-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree." This scale was chosen because it can capture variations in respondents' perceptions more finely and allows for a more comprehensive statistical analysis of the relationships between variables.

Each variable in this study was developed through a series of statements that represent its theoretical concept. The Health Care variable was measured through statements that describe the workers' awareness of the risks of UV exposure and the importance of maintaining skin health. The Perceived Physical Benefit variable reflects workers' perceptions of the physical benefits they feel from using sunscreen, such as protection from sunburn and the feeling of healthier skin. Meanwhile, the Aging Effect Benefit variable was measured through respondents' perceptions of the risks of premature aging, such as the appearance of wrinkles or dark spots due to UV exposure.

The Perceived Risk variable reflects the level of concern workers have about potential harm that may arise from using sunscreen, including worries about irritation, discomfort, doubts about effectiveness, as well as considerations regarding cost and product availability. The Perceived Ease of Use variable measures the extent to which respondents perceive sunscreen as a product that is easy to use, comfortable, and practical in the context of working in an outdoor area. Attitude Toward Behavior, or attitudes toward the use of sunscreen, is measured through workers' positive or negative evaluations of the behavior of using sunscreen regularly. Subjective Norm is explained by the extent to which workers
feel social pressure or support from colleagues and supervisors to use sunscreen at work. Meanwhile, Perceived Behavioral Control reflects respondents' belief in their ability to access, purchase, and consistently use sunscreen. Finally, the Purchase Intention variable, or intention to use sunscreen, is measured based on the extent to which respondents plan and are committed to using sunscreen in their daily work activities.

After the questionnaire was distributed and the data was collected, a series of tests were conducted to ensure the quality of the instrument and the validity of the data. A validity test was performed using item-total correlation to assess whether each statement item could measure the intended variable. Next, a reliability test using Cronbach's Alpha was conducted to ensure the

internal consistency of the instrument, ensuring that the question items for each variable are reliableAfter the instrument was declared valid and reliable, the study continued with a correlation test (Correlate) to examine the strength and direction of the relationships between the variables in the model. The next step was linear regression analysis, which was used to analyze the impact of independent variables on the dependent variable, thus enabling empirical testing of the hypotheses. Through this series of tests, the instrument and research data were deemed suitable for accurately and systematically describing sunscreen usage behavior among male mine workers.

Results and Respondent Profiles

Respondents in this study were recruited from various mining locations across Indonesia, using a judgmental sampling technique to ensure that the characteristics were nearly proportional. Data was collected from 291 male mine workers who work in field areas across several mining regions. Respondents were asked to participate in a survey regarding their behavior and perceptions of using sunscreen to protect their skin from sun exposure. The study was conducted over a one-month period, focusing on the demographic profile of the workers. Table 1 exhibits the detailed profiles of the respondents.

Regarding age, the majority of respondents fall within the productive age range. The largest age group is 36–45 years, comprising 39.9% of the respondents, followed by the 26–35 age group with 33.7%. The youngest age group, 18–25 years, only makes up 12.0% of the respondents. In terms of marital status, the majority (83.2%) are married, while 16.8% are single. The education level of most respondents is high school or diploma/Bachelor's degree, with 65.3% holding a Bachelor's degree and 24.7% having completed high school or its equivalent. Only 10% of respondents have a Master's or Doctoral degree.

In terms of job positions, the respondents are spread across various operational roles in the mine. The largest groups are Operators and Supervisors/Inspectors, each comprising 25.8%. The Manager position also holds a significant proportion at 25.8%, followed by Crew/Checker/Admin positions at 19.9%. Other positions include Foreman, Leading Hand, and Superintendent. This distribution of job positions ensures that the sample of respondents covers various levels of field workers, which is relevant for mapping sunscreen usage behavior in the context of the mining industry.

Correlation analysis shows the relationship between the five independent variables and the involvement of male mine workers. The strongest correlation factor is ATB (r = .842), followed by SN (r = .794), PPB (r = .736), AE (r = .701), with the weakest efficiency factor being HC (r = .594). Table 2 presents the descriptive statistics for each variable. Table 2 shows the values of descriptive statistics of each variable.

Table 1. Profile of respondents

No	Characteristics	Frequency	Percentage
1	Age		
	18-25 tahun	35	12.00%
	26-35 tahun	98	33.70%
	36-45 tahun	116	39.90%
	46-55 tahun	38	13.10%
	Di atas 55 tahun	4	1.40%
2	Marital Status		
	Single	49	16.80%
	Married	242	83.20%
3	Last Education		
	S2-S3	29	10.00%
	S1	190	65.30%
	High School or Below	72	24.70%
4	Job Title		
	Crew / Checker / Admin	58	19.90%
	Foreman / Leading Hand	23	7.90%
	Manager	75	25.80%
	Operator	30	10.30%
	Superintenden	30	10.30%
	Supervisor / Foreman	75	25.80%

Sources : Data Processing Results

The validity test was conducted through Exploratory Factor Analysis (EFA) using the Principal Component Analysis method to ensure that each indicator accurately represents the theoretical variables (Zikmund et al., 2013, p. 595). The results show that all research variables have Kaiser-Meyer-Olkin (KMO) values above the minimum threshold of 0.5, placing them in the very good category, with the following results: HC (0.822), PPB (0.823), AE (0.845), SN (0.728), ATB (0.781), PI (0.744), PR (0.714), PEU (0.755), and PBC (0.752).

To test reliability, this study uses the internal consistency of measurement items using Cronbach's alpha with values ranging from 0.885 to 0.961, indicating that each item has a strong correlation with its variable. All variables show alpha values well above the minimum threshold of 0.70. These findings confirm that all question items are valid and can be used in the measurement. Table 3 explains the validity and reliability of the measurement items.

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Table 2. Mean, SD, correlation matrix

Variabel	Mean	SD	HC	PPB	AE	SN	ATB	PI	PR	PEU
Health Care	4.3093	0.79038								
Perceived Physical Benefit	3.8771	0.97255	.722**							
Aging Effect	3.6744	1.02589	.604**	.881**						
Subjective Norm	3.8568	0.89299	.650**	.843**	.859**					
Attitude Toward Behavior	3.9376	0.9179	.691**	.828**	.760**	.883**				
Purchasing Intention	3.7721	1.01501	.594**	.736**	.701**	.794**	.842**			
Perceived Risk	2.5326	1.17964	-.130*	-.145*	-0.091	-0.107	-.151**	-.121*		
Perceived Ease of Use	3.7869	0.90107	.553**	.638**	.646**	.696**	.727**	.725**	-0.029	
Perceived Behavior Control	3.8305	0.898	.600**	.658**	.626**	.725**	.768**	.770**	-0.058	.848**

Sources : Data Processing Results

Table 3. The validity and reliability of measuring items

Construct	Code	Items	Factor Loading
Health Care (M. Simajuntak et al., 2025) Cronbach's Alpha : 0.897 KM0: 0.822	HC01	I believe that using sunscreen can make the skin healthier.	0.740
	HC02	I feel that it is important to have awareness in maintaining skin health.	0.925
	HC03	I believe that achieving healthy skin is my personal responsibility.	0.928
	HC04	I consider skin health to be very important.	0.936
Perceived Physical	PPB05	I believe that preventing skin conditions from worsening can be achieved by using sunscreen.	0.911

Benefit (M. Simajuntak et al., 2025) Cronbach's Alpha : 0.936 KM0: 0.823	PPB06	I believe that using sunscreen can prevent skin damage.	0.919
	PPB07	I feel that sunscreen can help restore damaged skin to its original condition.	0.916
	PPB08	I believe that using sunscreen can improve skin condition compared to before.	0.921
Aging Effect (M. Simajuntak et al., 2025) Cronbach's Alpha : 0.946 KM0: 0.845	AEB09	I believe that using sunscreen is one way to keep the skin looking youthful.	0.938
	AE10	I feel that using sunscreen can delay aging and maintain skin youthfulness.	0.931
	AE11	I believe that using sunscreen can help reduce wrinkles and dark spots on the skin.	0.902
	AE2	I consider the use of sunscreen important to maintain a youthful appearance.	0.939
Subjective Norm (M. Simajuntak et al., 2025) Cronbach's Alpha : 0.885 KM0: 0.728	SN13	I think that people close to me would approve of my decision to buy sunscreen.	0.904
	SN14	I believe that using sunscreen can delay the aging process and maintain youthful skin.	0.879
	SN15	Most people close to me think that I should buy sunscreen.	0.929
Attitude Toward Behavior (M. Simajuntak et al., 2025) Cronbach's Alpha : 0.961 KM0: 0.781	ATB16	I feel that purchasing sunscreen for men is the right decision.	0.961
	ATB17	I have a positive view toward purchasing sunscreen for men.	0.966
	ATB18	I feel that purchasing sunscreen is a wise decision.	0.965
Purchasing Intention (M. Simajuntak et al., 2025) Cronbach's Alpha : 0.938 KM0: 0.744	PI19	I intend to buy sunscreen in the future.	0.960
	PI20	I may buy or use sunscreen in the future.	0.959
	PI21	I will actively seek out sunscreen products.	0.919
Perceived Risk (A. Pamidimukkala et al., 2024) Cronbach's Alpha : 0.921 KM0: 0.714	PR22	I am concerned about experiencing financial loss when using sunscreen.	0.928
	PR23	I am confident that I will easily become skilled at using sunscreen.	0.959
	PR24	I am concerned about possible discomfort when using sunscreen.	0.902

Perceived Ease of Use (A. Pamidimukkala et al., 2024) Cronbach's Alpha : 0.923 KM0: 0.755	PEU25	I believe that using sunscreen will be easy to do.	0.919
	PEU26	I believe that it will be easy for me to use sunscreen wherever I want.	0.944
	PEU27	I believe that it will be easy for me to use sunscreen proficiently.	0.930
Perceived Behavior Control (J. Jeong et al., 2021) Cronbach's Alpha : 0.904 KM0: 0.752	PBC28	I have the ability and skills to use sunscreen on my own.	0.916
	PBC29	I have sufficient money, time, and opportunity to purchase and use sunscreen.	0.926
	PBC30	I have adequate information regarding how to use sunscreen.	0.906

Sources : Data Processing Results

Regression Analysis

To verify hypotheses H1–H8, the first regression model was conducted using five independent variables, namely Health Care, Perceived

Physical Benefit, Aging Effect, Perceived Risk, and Perceived Ease of Use, with Attitude Toward Behavior as the dependent variable, to examine their influence on respondents' attitudes toward sunscreen use. The second regression model was employed to test the effects of Attitude Toward Behavior, Subjective Norm, and Perceived Behavioral Control on purchase intention toward sunscreen products. All analyses were performed using SPSS.

Prior to conducting the regression analysis, multicollinearity was assessed. Following the recommendation of Hair et al. (2014), this study examined tolerance values and variance inflation factors (VIF). The results indicate that tolerance values ranged from 0.164 to 0.967, exceeding the threshold of 0.10, while VIF values ranged from 1.034 to 6.081, remaining below the cutoff value of 10. Therefore, the data are free from multicollinearity issues.

The effects of the independent variables on the dependent variables were measured using standardized regression coefficients (β). The results indicate that Health Care (β = 0,134; p < 0,01), Perceived Physical Benefit (β = 0,485; p < 0,001), Perceived Risk (β = –0,050; p > 0,05), Perceived of Use (β = 0,313; p < 0,001), Attitude Toward Behavior (β = 0,418; p < 0,001), Subjective Norm (0,170; p < 0,01), dan Perceived Behavior Control (β = 0,281; p < 0,001). Accordingly, hypotheses H1, H2, H4, H5, H6, H7, and H8 are supported by the data. However,

the Aging Effect (H3) is not supported, as its p-value exceeds the accepted significance level.

The results of the regression analysis indicate that Perceived Physical Benefit is the most dominant factor in shaping attitudes toward sunscreen use, followed by Perceived Ease of Use, Health Care, and Perceived Risk. In contrast, the Aging Effect does not significantly influence attitude formation. Furthermore, sunscreen purchase intention is significantly influenced by Attitude Toward Behavior, Perceived Behavioral Control, and Subjective Norm, indicating that psychological factors, accessibility, and social support play important roles in encouraging sunscreen use intention. Table 4 depicts the details of the statistical values as explained above.

Table 4. The hypothesis testing

Hypothesis	**Paths**	**Standardized coefficients (Beta)**	**t-Values**	**p** Values	**Tolerance**	**VIF**	**Status**
H1	Health Care	0.134	3.132	0.002	0.453	2.208	Supported
H2	Perceived Physical Benefit	0.485	6.834	<0,001	0.164	6.081	Supported
H3	Aging Effect	0.045	0.706	0.481	0.207	4.824	Unsupported
H4	Perceived Risk	-0.05	-1.716	0.087	0.967	1.034	Supported
H5	Perceived Ease of Use	0.313	7.943	<0,001	0.535	1.868	Supported
H6	Attitude Toward Behavior	0.418	6.987	<0,001	0.186	5.383	Supported
H7	Subjective Norm	0.170	2.691	0.008	0.215	4.653	Supported
H8	Perceived Behavior Control	0.281	6.055	<0,001	0.399	2.503	Supported

*p<0.01, **p<0.05, ***p<0.1

Sources : Data Processing Results

Discussion and Theoretical Contributions

This study provides theoretical contributions by extending the application of the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), and the Theory of Planned Behavior (TPB) in the context of health-protective behavior among male mine workers (Bosnjak et al., 2020). The findings indicate that attitudes toward sunscreen use and purchase intention are shaped by a combination of

Perceived Physical Benefit, Perceived Ease of Use, Health Care, Subjective Norm, and Perceived Behavioral Control (Li et al., 2021).

Perceived Physical Benefit emerges as the most dominant factor in shaping attitudes toward sunscreen use (White et al., 2019). This finding suggests that in work environments with high exposure to ultraviolet radiation, workers are more responsive to benefits that are immediate and functional rather than long-term outcomes (Horsham et al., 2020). In addition, Perceived Ease of Use plays an important role, reinforcing the relevance of TAM in explaining the adoption of health-related products in physically demanding work settings (Tamilmani et al., 2021).

Health Care also contributes to the formation of positive attitudes, although its influence is not as strong as that of Perceived Physical Benefit and Perceived Ease of Use (Carfora et al., 2017). In contrast, Aging Effect and Perceived Risk do not demonstrate significant roles, indicating that these factors are less relevant in the context of male mine workers who tend to prioritize functionality and occupational safety (Chan et al., 2020).

Furthermore, the findings strengthen TRA and TPB by demonstrating that Attitude Toward Behavior, Perceived Behavioral Control, and Subjective Norm jointly shape sunscreen purchase intention (Bosnjak et al., 2020). These results underscore the importance of an integrated theoretical approach in explaining health-protective behavior among high-risk worker groups (Montano & Kasprzyk, 2015).

In contrast, the Aging Effect does not demonstrate a significant role in shaping attitudes toward sunscreen use (Horsham et al., 2020). This suggests that long-term benefits, such as preventing premature aging, are less relevant in the context of male mine workers, who tend to prioritize more immediate concerns like skin protection from sunburn and overall skin health (White et al., 2019). The lack of a significant relationship with the Aging Effect may be attributed to the work environment's focus on practical and functional benefits, such as protection from UV-induced skin damage, rather than the delayed effects of aging (Dobbinson et al., 2014.) This finding aligns with Holman et al. (2022), which indicates that beliefs regarding immediate benefits, such as sunburn protection, have a stronger influence on sunscreen use behavior, compared to long-term aesthetic benefits like anti-aging, which are perceived as less important in work environments that prioritize immediate skin health and safety.

Managerial Implications

The findings of this study provide important managerial implications for mining companies and occupational safety stakeholders. As perceived physical benefits and ease of use are the primary factors shaping attitudes, skin health protection strategies should emphasize the practical functions of sunscreen that are directly relevant to fieldwork activities, such as

immediate protection from sun exposure and comfort during use.

Companies are encouraged to provide sunscreen products that are easy to apply, do not interfere with work activities, and are readily accessible at the workplace. In addition, skin health education should be integrated into occupational health and safety (OHS) programs to enhance workers' awareness of ultraviolet exposure risks and the importance of continuous skin protection.

The influence of Subjective Norm and Attitude Toward Behavior on purchase intention indicates that workplace support and organizational policies play a crucial role. The involvement of supervisors as role models, along with policies that ensure the availability of sunscreen, can promote sunscreen use as part of the occupational safety culture. In contrast, communication approaches that emphasize aesthetic concerns or anti-aging benefits are likely to be less effective in the context of male mine workers.

Limitations and Future Research

This study has several limitations that should be considered when interpreting the findings and designing future research. First, this study employed a cross-sectional design, collecting data at a single point in time; therefore, causal relationships among variables can only be inferred based on theoretical reasoning rather than actual temporal relationships. Future studies employing longitudinal designs or field experiments could provide stronger insights into how attitudes, intentions, and sunscreen use behaviors evolve over time, particularly within the dynamic context of mining work environments.

Second, this study relied on self-reported questionnaires, which are susceptible to biases such as social desirability bias and recall bias. Workers may provide responses that are perceived as more acceptable or may inaccurately report their sunscreen use frequency. Future research may benefit from combining self-report measures with field observations, recorded usage data, or wearable technologies capable of objectively measuring UV exposure and protective behaviors.

In addition, although Aging Effect Benefit did not exhibit a significant influence in this study, it represents a potential area for further exploration to better understand why long-term benefits are not prioritized by male mine workers. Future studies could investigate this issue using qualitative approaches, such as in-depth interviews or focus group discussions, to uncover psychological, social, or cultural factors that contribute to the low relevance of skin aging concerns in occupational self-protective behavior.

Finally, this study did not examine specific interventions or educational programs aimed at improving protective behaviors. Future research could employ controlled experimental designs to evaluate the effectiveness of different educational campaigns, sunscreen packaging designs, or

organizational policies in promoting consistent sunscreen use.

By addressing these limitations, future studies may provide deeper and more comprehensive contributions to understanding and improving ultraviolet exposure protection behaviors in mining environments and other outdoor industries.

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