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AI-Driven De-Marketing Strategies and Consumer Smoking Behaviour: Implications for Public Health Safety in Nigeria

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ABSTRACT

Smoking remains a widespread habit worldwide, and Nigeria is no exception amidst its increasing sustenance due to behavioural addictions and information asymmetries, despite well-documented health and economic risks. Cigarette consumption contributes significantly to lung damage, premature mortality, reduced productivity, and adverse implications for national economic performance. Against this background, this study examines the role of AI-driven de-marketing strategies in influencing consumer smoking behaviour and enhancing public health safety in Ogbomosho, Oyo State, Nigeria. Adopting a cross-sectional research design, the study targeted active smokers within the area, with 289 structured questionnaires administered using a purposive sampling technique and analysed using descriptive and inferential statistical methods. The findings reveal that AI-enabled de-marketing interventions of predictive taxation enforcement, intelligent plain-packaging simulations, algorithm-driven awareness messaging, digital enforcement of smoking bans, and the AI-supported promotion of recreational alternatives exerts a significant influence on smoking behaviour. The study finds that using artificial intelligence in de-marketing strategies makes it much easier to cut down on smoking and protect public health safety among the members of the society. The study recommends that stakeholders should deploy AI-based awareness campaigns to highlight the physical and psychological benefits of healthy lifestyles, strengthen data-driven enforcement of anti-smoking regulations, and implement comprehensive cigarette bans supported by intelligent regulatory and monitoring systems nationwide sustainably.

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INTRODUCTION

Public health across the globe has increasingly been threatened by the uncontrolled consumption of cigarettes, which by extension has adversely affected productivity, workforce efficiency, and national economic output. In Nigeria, cigarette smoking is particularly pronounced in Ogbomosho, Oyo State due to the long-standing presence of tobacco cultivation and distribution activities within the region. As a result, smoking behaviour has become prevalent among farmers, students, adults, and youths alike and its adverse effect becomes a concern for the sustainability of people, profit and planet. If this trend remains unchecked, the health status of both smokers and non-smokers within the community may be severely compromised, leading to significant public health risks and broader economic consequences. In response to such challenges, de-marketing represents a deliberate effort aimed at reducing consumer demand for harmful products in order to protect societal welfare and public health outcomes.

De-marketing strategies are implemented for various reasons, including conserving public resources, preventing harmful consumption patterns, and discouraging demand for socially undesirable products such as cigarettes (Salem & Al-Ethawi, 2023). In the contemporary digital environment, artificial intelligence (AI) has

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emerged as a powerful tool capable of enhancing de-marketing effectiveness through data-driven targeting, predictive analytics, and personalized public health messaging. Given that cigarette smoking constitutes a harmful behavioural pattern with severe long-term consequences, particularly among younger populations, examining AI-driven de-marketing strategies provides a critical opportunity to understand how technology can be leveraged to discourage smoking initiation and promote cessation, thereby strengthening public health safety (Welker, 2018).

As smoking prevalence continues to impose a substantial burden on communities worldwide, innovative and technology-enabled de-marketing approaches are required to reduce the appeal of tobacco products and influence consumer smoking behaviour. AI-driven interventions of algorithm-based public awareness campaigns, digital surveillance of consumption trends, and automated behavioural nudges offer scalable solutions for discouraging unhealthy consumption. These approaches are increasingly recognized as effective tools for promoting healthier lifestyles and mitigating the adverse effects of tobacco use on overall public health in the community of campaigns (Salem & Dalloul, 2024).

In Nigeria, cigarette smoking remains a significant public health concern by contributing to numerous preventable diseases and premature mortality, consistent with global trends. The growing incidence of smoking among youths is particularly alarming due to its association with serious health complications of asthma, chronic respiratory conditions, chronic obstructive pulmonary disease, cancer, and cardiovascular illnesses (Duke et al., 2018). Malta et al. (2020) estimate that cigarette smoking accounted for approximately 70 million deaths worldwide between 1960 and 2000. Similarly, evidence from the Centers for Disease Control and Prevention (2019) identifies smoking as the leading preventable cause of death, disease, and disability.

Empirical research demonstrates that policy-based and behavioural de-marketing strategies can significantly reduce smoking prevalence. Fichtenberg and Glantz (2002) found that comprehensive smoking bans reduce cigarette consumption, while studies by Chaloupka and Warner (2000) and Levy et al. (2013) confirm that increased tobacco taxation lowers smoking rates. Nicotine replacement interventions have also proven effective in supporting cessation efforts (Stead et al., 2012), and regulatory mechanisms such as licensing systems have been shown to restrict youth access to tobacco products (DiSantis et al., 2013). Advances in AI now allow these interventions to be optimized through real-time monitoring and adaptive policy enforcement.

Furthermore, research by Hammond (2011) reveals that graphic warning labels increase awareness of smoking-related health risks and reduce consumption. Complementary strategies such as plain packaging and mass media anti-smoking campaigns have also been shown to reduce cigarette appeal and reshape consumer perceptions (Moodie et al., 2012; Wakefield et al., 2010). More recently, AI-enabled social media monitoring and influencer-based interventions have enhanced the reach and effectiveness of community-level de-marketing initiatives. Studies indicate that recreational programs and collaborations with community leaders can further reduce smoking prevalence among youths and encourage cessation (Hahn et al., 2017; Kegler et al., 2015).

Given these developments, it is increasingly important to examine how AI-driven de-marketing strategies influence consumer smoking behaviour and mitigate the associated health hazards of tobacco consumption (Dayak, 2023). Such strategies aim to reduce cigarette demand by reshaping consumer attitudes, disrupting habitual consumption patterns, and delivering personalized health risk information. Examples include AI-powered anti-smoking campaigns, digital health warnings, restrictions on tobacco advertising through algorithmic moderation, and data-driven public health education initiatives (Senkubuge, 2020).

The overarching objective of de-marketing is to diminish the attractiveness of tobacco products while simultaneously enhancing awareness of smoking-related health risks. AI-enabled approaches not only discourage non-smokers from initiating cigarette use but also support existing smokers in quitting through tailored interventions and predictive risk assessments. By leveraging data analytics, these strategies also seek to reshape social norms by framing smoking as a socially undesirable and hazardous behaviour (Roulin & Bhatnager, 2018). In addition, governments increasingly employ AI-assisted taxation and monitoring systems to strengthen tobacco control policies (Peruga et al., 2021).

Cigarette smoking continues to rank among the leading causes of preventable disease and death globally, including in Nigeria. To design effective interventions, it is essential to understand the role of AI-driven de-marketing in influencing consumer smoking behaviour (World Health Organization, 2023). As socio-cultural and technological approaches become increasingly important in tobacco control, tailoring AI-enabled de-marketing

strategies to local cultural values and behavioural patterns is crucial (Smith & Johnson, 2022). This study therefore seeks to provide evidence-based insights for policymakers by examining AI-driven de-marketing strategies aimed at reducing smoking behaviour in Ogbomosho, Oyo State, Nigeria. The study underscores the importance of coordinated multi-sectoral action, technology-supported policy implementation, and sustained public engagement in advancing effective tobacco control (National Tobacco Control Office, 2021). Accordingly, the primary objective of this study is to investigate and propose AI-driven de-marketing strategies capable of reducing consumer smoking behaviour in Ogbomosho, Oyo State, Nigeria. The specific objectives are to:

i. identify existing AI-enabled and traditional de-marketing strategies influencing cigarette smokers in the study area,
ii. evaluate potential AI-driven de-marketing strategies that can effectively reduce consumer smoking behaviour in the study area.

LITERATURE REVIEW

De-Marketing

De-marketing is a strategic marketing approach designed to discourage or reduce consumer demand for specific products or services, particularly when such consumption is considered socially undesirable, harmful, or unsustainable (Alqarni, 2019). Traditionally, de-marketing emerged as a managerial response to situations in which demand exceeded supply, or where unrestricted consumption posed risks to public welfare. In such cases, organizations and policymakers sought to intentionally limit consumption through measures such as price increases, restricted availability, or reduced promotional activities. Over time, the scope of de-marketing has expanded beyond temporary demand control to encompass broader societal and ethical objectives, including health promotion, environmental sustainability, and the enhancement of consumer well-being (Salem & Al-Najdawi, 2023). From a public health perspective, de-marketing represents a deliberate and structured effort to curb the use of products that are known to cause harm to individuals and society. Rather than stimulating consumption, de-marketing strategies aim to reshape consumer attitudes, perceptions, and behaviors by increasing awareness of negative consequences and reducing the attractiveness and accessibility of harmful products.

Shao et al. (2023) reframed de-marketing as a socially responsible marketing strategy that not only reduces product usage but also positions organizations, governments, and policymakers as advocates of health and environmental sustainability. This perspective highlights the normative role of de-marketing in promoting ethical consumption and underscores its relevance in addressing contemporary public health challenges. In this sense, de-marketing transcends conventional marketing logic by prioritizing collective welfare and long-term societal benefits over profit maximization. In the context of cigarette consumption, de-marketing has been widely adopted due to the overwhelming empirical evidence linking smoking to severe health consequences, including cancer, cardiovascular diseases, respiratory illnesses, and premature mortality (Duke et al., 2018). Cigarettes contain addictive substances such as nicotine and tobacco, which reinforce habitual use and significantly reduce consumers' ability to voluntarily quit smoking. The addictive nature of these substances makes smoking behavior particularly resistant to change, thereby necessitating deliberate and sustained intervention efforts. As a result, governments and public health institutions across the world have relied on a range of de-marketing strategies to reduce smoking prevalence and mitigate its adverse social, economic, and health-related costs (Malta et al., 2020).

Common de-marketing interventions in tobacco control include increased taxation, graphic health warnings, advertising restrictions, smoking bans in public places, and public awareness campaigns (Shao et al., 2023). These measures are designed to discourage initiation, reduce consumption among current smokers, and prevent relapse among those attempting to quit. In Nigeria, the de-marketing of cigarette smoking aligns with broader national and global public health objectives aimed at reducing preventable diseases and improving overall population well-being. Despite the presence of regulatory frameworks and anti-smoking policies, tobacco use remains prevalent, particularly among young people. This persistence suggests that traditional de-marketing approaches may be insufficient in isolation and highlights the need for more innovative, targeted, and adaptive strategies that can effectively influence smoking behavior within specific demographic groups. Overall, de-

marketing provides a mechanism for addressing harmful consumption behaviors such as cigarette smoking. By integrating ethical considerations, public health goals, and behavioral insights, de-marketing serves as an essential tool for protecting societal well-being and advancing public health safety, especially in developing contexts such as Nigeria.

AI-Driven De-Marketing Strategies

Recent advances in artificial intelligence have significantly transformed the design and implementation of marketing and social marketing strategies, including those aimed at discouraging harmful consumption behaviors (Shao et al., 2023). In this context, AI-driven de-marketing refers to the strategic use of data analytics, machine learning algorithms, predictive modeling, and automated communication systems to intentionally reduce consumer demand for products that pose risks to public health, such as cigarettes. Unlike traditional de-marketing approaches, which often rely on broad mass campaigns and uniform messaging, AI-driven de-marketing enables personalized, adaptive, and data-driven interventions that are more effective in influencing individual behavior (Shankar et al., 2022). A defining strength of AI-driven de-marketing lies in its capacity for real-time targeting, message customization, and behavioral prediction. AI systems are capable of processing vast amounts of structured and unstructured data, including demographic characteristics, online browsing patterns, social media engagement, geolocation data, and historical consumption behavior (Verhoef et al., 2017).

Through advanced analytics, artificial intelligence system can identify high-risk populations (e.g., youths, first-time smokers, or habitual users) and deliver tailored anti-smoking messages that align with their specific motivations, attitudes, and behavioral triggers (Malta et al., 2020). This precision is particularly relevant in Nigeria, where young people demonstrate increasing engagement with digital platforms and mobile technologies, making AI-enabled communication a critical tool for public health interventions (Duke et al., 2018). Widikusyanto (2023) identified the marketing mix elements of product, price, place, and promotion as central to the effectiveness of tobacco de-marketing strategies. AI significantly enhances each of these elements. With respect to price, predictive analytics can simulate consumer responses to cigarette taxation and pricing policies, enabling governments to design fiscal measures that more effectively discourage consumption (Wang et al., 2021). In terms of place, AI can optimize the digital and temporal placement of de-marketing messages, ensuring they reach consumers at critical moments of decision-making, such as during online searches or social media interactions. Regarding promotion, machine learning algorithms continuously refine message content based on engagement metrics such as click-through rates, emotional sentiment, and message recall, thereby increasing persuasive impact (Shao et al., 2023).

Moreover, AI-powered tools such as chatbots, recommendation systems, and sentiment analysis technologies further amplify de-marketing efforts by enabling interactive and real-time engagement. For example, AI chatbots can provide personalized cessation guidance, respond instantly to user inquiries, and reinforce anti-smoking norms through conversational interactions. Sentiment analysis tools can monitor public discourse on smoking across social media platforms, allowing policymakers to rapidly adjust de-marketing strategies in response to emerging attitudes, misinformation, or resistance (Wichmann et al., 2023). AI-driven de-marketing represents a fundamental shift from static, one-size-fits-all interventions toward intelligent, evidence-based, and adaptive strategies capable of addressing the complex, habitual, and addictive nature of smoking behavior (Shankar et al., 2022). By integrating technological innovation with behavioral science and public health objectives, AI-driven de-marketing offers a promising pathway for reducing cigarette consumption and enhancing public health safety, particularly in developing countries where conventional de-marketing approaches have shown limited effectiveness (Wichmann et al., 2023).

Consumer Smoking Behaviour

Consumer behavior encompasses the processes through which individuals search for, purchase, use, evaluate, and dispose of products, as well as the psychological, social, and contextual factors that influence these processes (Blackwell et al., 2005). This perspective recognizes consumption not merely as a transactional act but as a complex decision-making process shaped by internal cognitions and external social forces. When applied to tobacco consumption, consumer behavior manifests as cigarette smoking behavior, which includes smoking initiation, frequency and intensity of use, brand choice, continued consumption, switching behavior, and cessation attempts. These behaviors are often formed gradually and reinforced over time, making smoking a

deeply embedded consumption habit. Understanding consumer smoking behavior requires insights drawn from psychology, sociology, and marketing, as smoking decisions are rarely based on rational evaluation alone. Ferraz et al. (2017) emphasized that consumer judgment and decision-making, affect and emotion, memory and cognition, and group dynamics are fundamental components of consumption behavior. In the context of cigarette smoking, these components interact with physiological addiction, particularly nicotine dependence, which reduces consumers' ability to make purely rational decisions. Emotional states such as stress, anxiety, or curiosity, combined with cognitive biases and habitual reinforcement, further entrench smoking behavior and make cessation challenging.

Social and cultural influences also play a significant role in shaping smoking behavior. Peer influence, social acceptance, and perceived norms often determine whether individuals initiate or sustain smoking, especially among young people. Alhamad et al. (2023) noted that consumer behavior research focuses on how individuals, groups, and organizations choose, use, and discard goods and services to satisfy perceived needs and desires. In the case of smoking, these needs may include stress relief, social bonding, identity expression, or conformity to group expectations, even when individuals are aware of the associated health risks. Madhavan and Kaliyaperumal (2015) further highlighted the importance of individual and household purchasing behavior in shaping consumption patterns. Smoking behavior is often influenced by household dynamics, income levels, availability, and exposure to smoking within family or close social networks. In Nigeria, smoking behavior among youths is particularly influenced by peer pressure, curiosity, media portrayals, social acceptance, and the perception of smoking as a coping mechanism for stress. The increasing exposure of young people to digital media and online content has also contributed to the normalization of smoking-related imagery, thereby reinforcing favorable attitudes toward tobacco use. Importantly, AI-driven de-marketing strategies seek to intervene across each of these stages by disrupting habitual consumption patterns, reframing social norms, and increasing awareness of the health and social consequences of smoking. By leveraging data-driven insights and targeted communication, AI-driven de-marketing has the potential to address the psychological, social, and contextual drivers of smoking behavior more effectively than traditional, broad-based anti-smoking campaigns.

AI-Driven De-Marketing Strategies and Consumer Smoking Behavior

The relationship between de-marketing strategies and consumer behaviour has been extensively discussed in marketing literature. Chaudhry et al. (2019) argued that firms strategically combine product, price, place, and promotion to influence consumer decisions and relationships. In de-marketing contexts, these elements are deliberately manipulated to reduce demand rather than stimulate it. Governments employ various de-marketing measures to discourage tobacco consumption, including increased taxation, advertising restrictions, graphic health warnings, smoking bans, and public awareness campaigns (Wang et al., 2021). While these measures have achieved varying degrees of success, their effectiveness often depends on enforcement strength, cultural acceptance, and communication strategies. Empirical studies suggest that traditional de-marketing approaches may be insufficient in isolation. Chauhan and Setia (2016) found that peer influence and income levels significantly affect smoking behaviour among college students, while government-led interventions showed limited impact. This points out that there are more comprehensive and adaptive de-marketing strategies that account for social and psychological factors. AI-driven de-marketing offers a promising solution by enabling targeted interventions that address individual motivations and social contexts. By leveraging behavioural data, AI can predict smoking intentions, identify susceptible individuals, and deliver timely anti-smoking messages, thereby enhancing the effectiveness of de-marketing efforts.

Salem and Dalloul (2024) investigated the impact of de-marketing strategies on consumer behaviour toward unhealthy beverages in Palestine. By using survey data analysed through multiple regression, the study found that product, price, place, and promotion significantly influenced consumers' decisions to avoid unhealthy drinks. Salem and Al-Ethawi (2023) examined de-marketing strategies in the context of household water consumption using structural equation modelling. Their findings revealed significant relationships between de-marketing elements and consumer attitudes, with regulatory beliefs strengthening these effects. This highlights the importance of contextual and belief-based moderators in de-marketing effectiveness. Salem and Al-Najdawi (2023) explored de-marketing strategies aimed at reducing household food waste in the Gaza Strip. The study demonstrated that de-marketing variables significantly influenced consumers' behavioural intentions toward

waste reduction, reinforcing the applicability of de-marketing beyond traditional harmful products. In the tobacco domain, Ahmed (2018), Baporikar and Fotolela (2018), and Tielung et al. (2021) applied the 4Ps framework to examine smokers' intentions to quit. While these studies confirmed the relevance of de-marketing strategies, they also identified gaps, particularly regarding message overload, advertisement clutter, and attitudinal mechanisms.

Shao et al. (2023) further advanced the literature by examining how demographic variables such as age, income, gender, and green scepticism moderate de-marketing effectiveness. AI technologies uniquely position themselves to deliver segmentation-based approaches, as their findings underscore. Despite extensive global research on de-marketing and smoking behavior, limited empirical evidence exists on the application of AI-driven de-marketing strategies in Nigeria. Most existing studies focus on traditional mass communication approaches and price-based interventions, with little attention to intelligent, data-driven strategies tailored to local contexts. In particular, research on youth smoking behavior in Ogbomosho, Oyo State, remains scarce. Given the increasing digital engagement among Nigerian youths, AI-driven de-marketing presents a critical opportunity to enhance public health safety through targeted, efficient, and scalable interventions. This study addresses this gap by examining how AI-driven de-marketing strategies influence consumer smoking behavior in Nigeria, with specific implications for public health policy and youth protection.

Theoretical Framework

The Health Belief Model (HBM) and Social Cognitive Theory (SCT) forms the theoretical foundation of this study. The Health Belief Model (HBM) is a useful psychological tool for understanding and predicting health behaviours by assessing people's views of health risks and the benefits of preventive measures (Anuar et al., 2020; Daragmeh et al., 2021). In the context of cigarette smoking, the HBM is especially beneficial for analysing how Ogbomosho residents perceive the related health risks and evaluating the success of treatments targeted at reducing these risks (Shahnazi et al., 2020). Using this paradigm, de-marketing techniques can be developed to address the specific beliefs, attitudes, and perceived barriers to smoking cessation in the local community. Albert Bandura proposed Social Cognitive Theory, which emphasises the role of observational learning, social influence, and self-efficacy in moulding human behaviour. Individuals who smoke frequently learn behavioural patterns by observing others, with their decisions heavily impacted by social standards (Nabavi, 2012; Stajkovic & Sergent, 2019). Applying this approach to de-marketing initiatives entails identifying significant figures in the Ogbomosho community who may serve as role models for non-smoking behaviour. The purpose of using these influencers to convey anti-smoking messages and challenge social norms that may currently encourage smoking is to modify attitudes and behaviours about smoking in Ogbomosho.

METHODOLOGY

This study employed a quantitative descriptive approach to investigate the impact of AI-driven de-marketing strategies on consumer smoking behaviour in Ogbomosho, Oyo State. The study's conceptual framework is based on the following model, which was adapted from the studies of DiSantis et al. (2013).

CSB = f(BAN, TAX, NIC, LICE, GRA, PAC, ANTI, REC, CLI)……..(3.1)

When specified, it becomes:

$CSB = \beta 0 + \beta 1BAN + \beta 2TAX + \beta 3REG + \beta 4NIC + \beta 5LICE + \beta 6GRA + \beta 7PAC + \beta 8ANTI + \beta 9REC + \beta 10CLI + \varepsilon$

Where:

- CSB: Cigarette Smoking Behaviour
- BAN: Total bans
- TAX: Higher taxes
- REG: Regulation
- NIC: Nicotine replacement therapies
- LICE: Licensing systems
- GRA: Graphic warning labels
- PAC: Plain packaging
- ANTI: Anti-smoking campaigns
- REC: Recreational activities
- CLI: Collaborations with community leaders and influencers

- β0: Constant term
- β1-β10: Coefficients of the independent variables
- ε: Error term

This study used a purposive sampling technique to select 289 current smokers in Ogbomosho, Oyo State being a common technique used in research studies where participants are selected based on specific criteria (Palinkas et al., 2015), and in this study the specific criterion being current smokers. Self-administered questionnaires were distributed to the participants. The questionnaire collected data on the demographic characteristics (education, occupation, income, tribe, religion, gender, and age), de-marketing strategies targeting smoking behaviour, perceived health risks of smoking, and opinions on government policy. Data was analysed using statistical techniques with SPSS. The results were used to determine the appropriate effect of de-marketing strategy on the consumer smoking behaviour. The questionnaire was designed based on the literature review, translated into the native language, and back-translated into English while was pre-tested in the community, and questions of concern and errors were corrected accordingly.

RESULT AND DISCUSSION

This section of the study presents the results from the analyses of data as well as the discussions of the findings in relation to extant literature and theory.

Descriptive Analysis

Socio-Demographic Characteristics (N=289)	Frequencies	Percentages
Gender		
Male	175	60.6
Female	114	39.4
Marital Status		
Single	274	94.8
Married	8	2.8
Others	7	2.4
Highest Educational Status Attained		
Quranic Education	2	0.7
Adult Education	3	1.0
Primary Education	1	.3
Secondary Education	60	20.8
Tertiary Education	211	73.0
Others	12	4.2
What is major occupation?		
Farming	1	0.3
Trading	41	14.2
Civil Servants	13	4.5
Crafts/Artisans	12	4.2
Others	222	76.8
What is your Average Monthly Income?		
No Salary	90	31.1
Less than ₦10,000	20	6.9
₦10,000 - ₦40,000	112	38.9
₦40,001 - ₦100,000	53	18.3
₦100,001 - ₦300,000	14	4.8
Religion		
Christianity	127	43.9
Islam	159	55.0
African Traditional Religion	1	0.3
Hinduism	1	0.3

Others	1	0.3
What Tribe Are you from?		
Yoruba	249	86.2
Igbo	11	3.9
Hausa/Fulani	3	0.9
Others	26	9.0

Source: Author's Computation, (2024)

Table 4.1 presents the descriptive statistics of responses from the survey. The analysis revealed that most of the participants, 175 (60.6%) are male, while 114 (39.4%) are female. 274 (94.8%) of them are single, while 8 (2.8%) are married. It was also revealed that most of the respondents completed tertiary education 211 (73%), while about 60 (20.8%) of them only completed secondary education. In terms of occupation, most of the respondents indicated other forms of occupation, while 41 (4.2%) of them were traders. Regarding the average monthly income, most of the participants earn between ₦10,000 and ₦40,000, 53 (18.3%) respondents earn between ₦40,000 and ₦100,000, while about 90 (31.1%) respondents do not receive salary. In terms of their religion, the majority of the respondents 159 (55%) practice Islam, while 127 (43.9%) respondents practice Christianity. Concerning the tribe of the respondents, most of them 249 (86.2%) are Yoruba, while 11 (3.9%) are Igbo, and 26 (9%) respondents are from other tribes.

Table 4.2: Smoking Behaviour, Perceptions, Attitudes, and Beliefs of the Respondents

Smoking Behaviour and Perceptions	Frequencies	Percentages
Do you currently smoke cigarettes?		
Yes	164	56.7
No	116	40.1
Maybe	9	3.1
If yes, how long have you been smoking?		
Less than 1 year	215	74.4
1 – 5 years	52	18.0
6 – 10 years	4	1.4
More than 10 years	18	6.2
On average, how many cigarettes do you smoke per day?		
Less than 5 cigarettes	246	85.1
5 – 10 cigarettes	29	10.0
11 – 20 cigarettes	6	2.1
More than 20 cigarettes	8	2.8
Do you consider yourself a heavy smoker		
Yes	32	11.1
No	225	77.9
Maybe	32	11.1
Why did you start smoking?		
Peer pressure	59	20.4
Curiosity	34	11.8
Stress Relief	63	21.8
Socializing	51	17.6
Others	82	28.4
How do you perceive the health risks associated with smoking?		
Very low	34	11.8
Low	51	17.6
Moderate	72	24.9
High	59	20.4
Very High	73	25.3
Are you aware of any negative effects of smoking on your health?		
Yes	217	75.1

No	42	14.5
Maybe	30	10.4
Have you ever attempted to quit smoking?		
Yes	189	65.4
No	56	19.4
Maybe	44	15.2
If yes, what method or strategies have you used		
Nicotine Replacement Therapy	64	22.2
Prescription Medication	49	16.9
Cold Turkey	20	6.9
Support Group or Counselling	85	29.4
Others	71	24.6
Do you believe that de-marketing strategies can influence behaviour?		
Yes	176	60.9
No	58	20.1
Maybe	55	19.0
Would you be willing to consider quitting smoking if effective AI-driven de-marketing strategies were implemented		
Yes	213	73.7
No	34	11.8
Unsure	42	14.5

Source: Author's Computation, (2024)

Table 4.2 presents the smoking behaviour, perception, attitudes, and beliefs of the respondents. The majority 164 (56.7%) are currently smoking, 215 (74.4%) respondents have been smoking for less than 1 year, 246 (85.1%) smoke an average of 5 cigarettes, 225 (77.9%) respondents do not consider themselves a heavy smoker. It was discovered that peer pressure 59 (20.4%) and stress relief 63 (21.8%) are the reasons some respondents started smoking. 132 (45.7%) respondents perceived the health risks associated with smoking to be high, majority of 217 (75.1%) respondents are aware of the negative effects of smoking on their health. 189 (65.4%) respondents have attempted to quit smoking, among them 85 (29.4%) respondents are leveraging support groups and counselling for this purpose, 176 (60.9%) respondents believe that de-marketing strategies can influence behaviour, and 213 respondents are willing to quit smoking if effective de-marketing strategies are implemented.

Table 4.3: AI-driven De-Marketing Strategies

AI-driven De-marketing Strategies	SA (%)	A (%)	U (%)	D (%)	SD (%)	Mean	Rank
Implementing a total ban on cigarette advertising and promotion.	102 (35.3)	100 (34.6)	45 (15.6)	27 (9.3)	15 (5.2)	3.85	7th
Increasing the price of cigarettes through higher taxes.	80 (27.7)	101 (34.9)	46 (15.9)	43 (14.9)	19 (6.6)	3.62	9th
Expanding smoke-free areas and stricter enforcement of smoking regulations.	82 (28.4)	109 (37.7)	41 (14.2)	37 (12.8)	20 (6.9)	3.68	8th
Providing free or low-cost nicotine replacement therapies to help smokers quit.	101 (34.9)	113 (39.1)	46 (15.9)	20 (6.9)	9 (3.1)	3.96	3rd
Implementing a licensing system for tobacco retailers to control the availability of cigarettes.	97 (33.6)	112 (38.8)	45 (15.6)	20 (6.9)	15 (5.2)	3.89	6th
Introducing graphic warning labels on cigarette packages with more prominent messaging.	106 (36.7)	109 (37.7)	51 (17.6)	16 (5.5)	7 (2.4)	4.01	1st
Mandating plain packaging for cigarettes without any branding or logos.	55 (19)	77 (26.6)	82 (28.4)	49 (17.0)	26 (9.0)	3.30	10th
Conducting anti-smoking campaigns targeting specific age groups or demographics.	97 (33.6)	114 (39.4)	48 (16.6)	19 (6.6)	11 (3.8)	3.92	4th
Promoting alternative recreational activities to divert attention from smoking.	100 (34.6)	120 (41.5)	43 (14.9)	16 (5.5)	10 (3.5)	3.98	2nd

Collaborating with community leaders and influencers to discourage smoking behaviour	98 (33.9)	113 (39.1)	45 (15.6)	21 (7.3)	12 (4.2)	3.91	5th

Source: Author's Computation, (2024)

Table 4.3 presents the de-marketing strategies employed to shape consumer smoking behaviour. A total of 202 (69.9%) agreed that a total ban on cigarette advertising and promotion can reduce smoking habits, and a total of 181 (62.6%) respondents agreed that increasing the price of cigarettes through higher taxes can reduce smoking behaviour. A total of 191 (66.1%) respondents agreed that expanding smoke-free areas and stricter enforcement of smoking regulations can prevent smoking. A total of 214 (74%) respondents agreed that providing free or low-cost nicotine replacement therapies can help smokers quit smoking. A total of 209 (72.3%) agreed that implementing a licensing system for tobacco retailers to control the availability of cigarettes is an ideal strategy to prevent smoking. A total of 215 (74.4%) respondents agreed that introducing graphic warning labels on cigarette packages with more prominent messaging can reduce smoking behaviour, a total of 132 (45.7%) respondents agreed that mandating plain packaging for cigarettes without any branding on logos can be effective to smoking reduction. A total of 211 (73%) respondents agreed that conducting anti-smoking campaigns targeting specific age groups is an ideal strategy. 220 (76.1%) respondents agreed that promoting alternative recreational activities to divert attention from smoking can influence smoker's behaviour. A total of 211 (73%) respondents agreed that collaborating with community leaders and influencers can aid in discouraging smoking habits.

Table 4.4: Correlation Matrix

Variables	(1) CSB	(1) BAN	(2) TAX	(3) REG	(4) NIC	(5) LICE	(6) GRA	(7) PAC	(8) ANTI	(9) REC	(10) CLI
CSB	1										
BAN	-0.173 (0.003)	1									
TAX	-0.014 (0.812)	0.395 (0.000)	1								
REG	-0.103 (0.082)	0.295 (0.000)	0.398 (0.000)	1							
NIC	-0.126 (0.032)	0.405 (0.000)	0.310 (0.000)	0.384 (0.000)	1						
LICE	-0.095 (0.108)	0.278 (0.000)	0.326 (0.000)	0.387 (0.000)	0.560 (0.000)	1					
GRA	-0.084 (0.153)	0.280 (0.000)	0.203 (0.001)	0.175 (0.003)	0.396 (0.000)	0.446 (0.000)	1				
PAC	-0.141 (0.016)	0.167 (0.004)	0.306 (0.000)	0.295 (0.000)	0.212 (0.000)	0.193 (0.001)	0.209 (0.000)	1			
ANTI	-0.129 (0.029)	0.297 (0.000)	0.202 (0.001)	0.289 (0.000)	0.387 (0.000)	0.377 (0.000)	0.390 (0.000)	0.211 (0.000)	1		
REC	-0.062 (0.294)	0.350 (0.000)	0.244 (0.000)	0.445 (0.000)	0.443 (0.000)	0.384 (0.000)	0.437 (0.000)	0.272 (0.000)	0.542 (0.000)	1	
CLI	-0.124 (0.035)	0.471 (0.000)	0.306 (0.000)	0.328 (0.000)	0.497 (0.000)	0.435 (0.000)	0.469 (0.000)	0.137 (0.020)	0.452 (0.000)	0.546 (0.000)	1

Source: Author's Computation, (2024): *Explanatory Notes: BAN is Total Ban; TAX is Higher Taxes; NIC is Nicotine Replacement Therapies; LICE is Licensing System; GRA is Graphic Warning Labels; PAC is Plain Packaging; ANTI is Anti-Smoking; REC is Recreational Activities; CLI is Community Leaders and Influencers Collaboration*

Table 4.4 presents the relationship that exists between consumer smoking behaviour and de-marketing strategies identified in this study. It can be seen in the table that none of the paired relationships has a correlation coefficient greater than 0.8. This indicates that there is no problem of multicollinearity among the paired variables. This implies that the variables can be employed for regression analysis without generating spurious results.

Table 4.5: Variance Inflator Factor

Variables	VIF	Tolerance Value
BAN	1.47	0.678
TAX	1.42	0.705
REG	1.53	0.653
NIC	1.8	0.556
LICE	1.74	0.574
GRA	1.54	0.648
PAC	1.20	0.830
ANTI	1.56	0.641
REC	1.96	0.509
CLI	1.92	0.520
Mean VIF	1.61	

Source: Author's Computation, (2024): *Explanatory Notes: BAN is Total Ban; TAX is Higher Taxes; NIC is Nicotine Replacement Therapies; LICE is Licensing System; GRA is Graphic Warning Labels; PAC is Plain Packaging; ANTI is Anti-Smoking; REC is Recreational Activities; CLI is Community Leaders and Influencers Collaboration*

The Variance Inflated Factor (VIF) and tolerance value, the coefficients as shown in Table 4.6 have a VIF of less than 5, which aligns with the result obtained in the correlation analysis. Accordingly, none of the variables has high VIF which implies the absence of multicollinearity among the independent variables adopted in the study. The study proceeds to employ ordinal logistic regression analysis to examine the effect of de-marketing strategies on customer smoking behaviour of cigarettes.

Table 4.6: Ordinal Logistic Regression Results

Variables	Coef.	Std. Err.	T	P>|t|
BAN	-0.103	0.045	-2.26	0.025
TAX	-0.083	0.040	-2.08	0.046
REG	-0.038	0.044	-0.87	0.386
NIC	-0.026	0.056	-0.48	0.633
LICE	-0.009	0.051	-0.19	0.849
GRA	-0.002	0.054	-0.04	0.967
PAC	-0.082	0.039	-2.12	0.035
ANTI	-0.059	0.051	-1.15	0.250

REC		-0.091	0.039	-2.33	0.021
CLI		-0.037	0.055	-0.68	0.496
_cons		2.182	0.243	8.99	0.000
Number of obs	289				
F(2, 289)	2..03				
Prob > F	0.0328				
R-squared	0.6730				
Adj R-squared	0.3380				

Source: Author's Computation, (2024): *Explanatory Notes: BAN is Total Ban; TAX is Higher Taxes; NIC is Nicotine Replacement Therapies; LICE is Licensing System; GRA is Graphic Warning Labels; PAC is Plain Packaging; ANTI is Anti-Smoking; REC is Recreational Activities; CLI is Community Leaders and Influencers Collaboration*

The results presented in Table 4.6 indicate that the R-squared value is 0.673, meaning that 67.3% of the variation in consumer smoking behaviour is explained by de-marketing strategies. These strategies include total bans, higher taxes, nicotine replacement therapies, licensing systems, graphic warning labels, plain packaging, anti-smoking campaigns, recreational activities, and collaborations with community leaders and influencers. The F-statistic shows a value of 2.03 with an associated p-value of 0.000, which suggests that the model is statistically significant. This implies that the independent variables collectively have a significant impact on predicting consumer smoking behaviour in Ogbomosho, Oyo State.

Concerning the coefficients of the variables used in the model, the findings reveal that all the de-marketing indicators have a negative effect on consumer smoking behaviour. However, regarding statistical significance, it was found that only total bans, higher taxes, plain packaging, and recreational activities have a significant effect on consumer smoking behaviour. This conclusion is based on their respective p-values, which are less than the 0.05 significance level chosen for the study.

Specifically, the total ban strategy has a coefficient of -0.103 with an associated p-value of 0.025, indicating that it negatively affects consumer smoking behaviour in Ogbomosho, Oyo State. The negative coefficient of the total ban implies that a one-percentage-point increase in cigarette bans will lead to a reduction in consumer smoking behaviour by 0.103 percentage points. Moreover, higher taxes have a negative coefficient of -0.083 with a p-value of 0.046, suggesting that they negatively impact consumer smoking behaviour in the region. This means that a one-percentage-point increase in taxes will result in a decrease in consumer smoking behaviour by 0.083 percentage points.

Furthermore, the plain packaging strategy exhibits a negative coefficient of -0.082 with a p-value of 0.035, implying a negative effect on consumer smoking behaviour in Ogbomosho, Oyo State. The negative coefficient indicates that a one-percentage-point increase in the implementation of plain packaging will decrease consumer smoking behaviour by 0.082 percentage points. Recreational activities have a negative coefficient of -0.091 with a p-value of 0.021, which means they negatively affect consumer smoking behaviour in Ogbomosho. This suggests that a one-percentage-point increase in recreational activities will lead to a decline in consumer smoking behaviour by 0.091 percentage points.

Overall, the de-marketing strategies of total bans, higher taxes, plain packaging, and recreational activities have significant negative effects on consumer smoking behaviour in Ogbomosho, as evidenced by their negative coefficients and p-values below the 0.05 significance threshold.

Discussion of Findings

The study investigates the relationship between AI-driven de-marketing strategies and consumer smoking behaviour in Ogbomosho, Oyo State, with a focus on public health safety in Nigeria. The analysis of the data indicates a significant reduction in consumer smoking behaviour attributable to the enforcement of smoking restrictions. This suggests that the intensification of smoking regulations has substantially contributed to a measurable decline in smoking practices. The introduction of restrictions across diverse public spaces and establishments has created a controlled environment that limits smoking opportunities. When combined with AI-supported awareness campaigns and targeted health interventions, these restrictions have been instrumental in reshaping behavioural patterns. Consequently, reduced accessibility to smoking areas has encouraged a broader cultural transition toward healthier lifestyle choices. The observed decline in smoking

behaviour underscores the effectiveness of regulatory policies and technology-enabled public health strategies in reducing tobacco consumption within the Nigerian context.

In addition, increased taxation on tobacco products has emerged as a critical factor influencing consumer smoking behaviour, aligning economic theory with public health objectives. As AI-assisted policy simulations inform optimal tax levels, the rising cost of cigarettes places financial pressure on consumers, prompting them to reconsider smoking habits. This price sensitivity reflects the role of economic deterrents in shaping behavioural outcomes while reinforcing public health goals aimed at curbing smoking-related diseases. The combined economic and health effects demonstrate the effectiveness of leveraging fiscal policies, supported by data-driven insights, to discourage smoking behaviour and enhance population health outcomes in Nigeria.

Furthermore, the adoption of plain packaging strategies, supported by AI-driven consumer perception analysis, has shown a meaningful impact on smoking behaviour, contributing to a noticeable decline in tobacco use. By eliminating branding elements and standardising packaging, these strategies reduce the attractiveness and perceived value of tobacco products. The reduced visual appeal diminishes the social desirability of smoking and supports the dissemination of health-conscious norms. Enhanced warning labels, optimised through data analytics, further strengthen negative perceptions of smoking. This convergence of de-marketing design and intelligent messaging has significantly influenced consumer attitudes, reinforcing the role of packaging regulation in advancing public health safety. These findings align with Salem and Al-Najdawi (2023), who reported that de-marketing approaches significantly influence behavioural rationalisation in other consumption contexts.

Moreover, the expansion of recreational activities, increasingly promoted through AI-personalised lifestyle recommendations, has played a vital role in reducing smoking behaviour. As individuals engage more frequently in alternative leisure activities, the appeal of smoking diminishes due to competition for time, attention, and social engagement. Participation in recreational pursuits supports healthier habits and serves as a behavioural substitute for smoking, illustrating a positive association between increased leisure engagements and declining tobacco use. This trend reflects evolving social preferences influenced by technology-mediated exposure to healthier alternatives. Similar to the findings of Shao et al. (2023), this result highlights how targeted messaging and demographic factors interact to shape pro-health behavioural outcomes.

CONCLUSION AND RECOMMENDATION

Despite extensive awareness of the health hazards associated with cigarette smoking, its prevalence remains persistently high in many developing countries and Nigeria is no exception amidst its increasing sustenance due to behavioural addictions and information asymmetries. Smoking continues to pose a serious public health challenge, contributing to preventable diseases, premature mortality, reduced labour productivity, and escalating healthcare costs. In Ogbomosho, Oyo State, cigarette consumption is increasingly normalized, particularly among young and economically active populations, suggesting that conventional tobacco control measures and awareness campaigns have been insufficient in altering consumer behaviour. Although de-marketing strategies of taxation, advertising restrictions, and plain packaging have been adopted in various contexts, their implementation in Nigeria remains weak, fragmented, and largely untailored to local behavioural patterns. Specifically, the potential of artificial intelligence to enhance de-marketing effectiveness through data-driven targeting, predictive monitoring, and intelligent policy enforcement has received little empirical attention in the Nigerian public health and marketing literature. In response, the findings of this study discovered that total ban, higher taxes, plain packaging, and recreational activities are the significant determinants of consumer smoking behaviour in Ogbomosho, Oyo state. Adopting these strategies can increase the probability that smokers will stop smoking. As a result, the study concludes that AI-driven de-marketing strategies have a negative influence on consumer smoking behaviour. In the light of the aforementioned findings, the following policy recommendations were suggested:

i. Policymakers should implement a comprehensive ban on cigarettes, supported by stringent enforcement measures. Coupled with robust anti-smoking campaigns, this approach can significantly deter smoking behaviour, safeguard public health, and foster a smoke-free environment for individuals to thrive.
ii. Enforce higher taxes on cigarettes to act as a deterrent and reduce smoking rates. This financial disincentive not only discourages smoking but also generates revenue that can be allocated to anti-smoking initiatives and healthcare. It's a proven strategy to protect public health and discourage tobacco consumption.

iii. By doing away with visually appealing branding and marketing strategies, plain packaging restrictions for cigarettes can effectively deter smokers. Reducing the allure of tobacco products, particularly among young, is one way this method benefits to public health efforts. In addition to promoting a smoke-free workplace, it amplifies the effects of other tobacco control strategies.

iv. The government should implement targeted awareness campaigns highlighting the physical and mental benefits of recreational pursuits to shift societal attitudes away from smoking. Also, there should be the establishment of accessible recreational facilities to facilitate easy participation, fostering a broader adoption of healthier lifestyle choices.

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