International Journal of Education and Life Sciences (IJELS)
Vol. 4, No. 10 October 2026: 1801-1820

Determinants of Gender-Based Discrimination Against Women Entrepreneurs in the Waste Recycling Sector in Lagos, Nigeria

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A R T I C L E I N F O

Keywords: Gender-Based Discrimination, Women Entrepreneurs, Waste Recycling, Circular Economy, Informal Economy, Gender Inequality, Lagos State, Nigeria.

Received : 27 August
Revised : 20 September
Accepted: 18 October

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A B S T R A C T

Gender-based discrimination remains an important but underexamined constraint to women's entrepreneurship in the informal waste-recycling economy. While previous studies in Nigeria have documented gendered participation and barriers in waste picking, limited empirical evidence exists on the socioeconomic, entrepreneurial, economic, institutional, and environmental factors associated with women's experience of discrimination across the broader recycling value chain. This study examined the determinants of gender-based discrimination among women entrepreneurs in the waste-recycling sector in Lagos State, Nigeria.. The findings indicate that age, education, marital status, cooperative membership, spouse involvement, entrepreneurial experience, access to finance, market access, access to recyclable materials, training, and business registration are statistically associated with women's reported experience of discrimination, while social networks, language barriers, business size, monthly business income, institutional support, and exposure to hazardous waste are not statistically significant. The findings suggest that gender-based discrimination in Lagos's waste-recycling sector is not merely an interpersonal problem but is embedded in women's access to productive resources, markets, collective organizations, formalization, and institutional structures. The study recommends gender-responsive financing, improved market and material access, cooperative strengthening, inclusive business formalization, rights-based training, and improved occupational safety to promote a more equitable and inclusive recycling economy.

DOI: https://doi.org/10.59890/ijels.v4i10.107
ISSN : 3026-2429
https://journalijels.my.id/index.php/ijels

INTRODUCTION

The shift from a linear economic model based on "take–make–dispose" toward a circular economy has increased global attention to waste recovery, reuse, recycling, and resource efficiency as mechanisms for achieving environmental sustainability and inclusive economic development. Beyond their environmental value, recycling and related circular activities constitute an important source of employment and entrepreneurship, particularly in developing countries where informal enterprises play a substantial role in waste collection, sorting, recovery, and trading. Recent global evidence estimates that between 121 and 142 million people are engaged in circular-economy activities, including recycling, waste management, repair and second-hand trade, with a substantial proportion working in informal employment (Circle Economy, ILO, World Bank, & UN-PAGE, 2025). The employment potential of circular activities therefore makes the sector relevant not only to environmental policy but also to poverty reduction, entrepreneurship development and inclusive economic transformation.

Despite this potential, participation in the waste economy is not socially or economically neutral. Informal recycling and waste recovery frequently operate under precarious conditions characterized by weak institutional protection, limited access to finance and technology, unsafe working environments, unstable markets and inadequate social protection. The World Bank noted that waste collection, sorting and recycling in developing economies are frequently concentrated in informal activities associated with low-quality employment, hazardous working conditions and limited access to protective equipment and social protection (World Bank, 2021). Consequently, the benefits generated by the circular economy may not be distributed equally among participants.

Gender represents an important dimension of this inequality. Women participate in waste collection, sorting, recycling, aggregation, trading and other activities along the waste value chain, but their participation can be constrained by gender norms, unequal access to productive resources, limited market opportunities, occupational risks and exclusion from decision-making structures. UN Women (2025) specifically identified women as important actors in Nigeria's informal recycling economy while highlighting barriers involving access to cooperatives, leadership, occupational safety and finance. Such barriers can limit women's ability to enter profitable segments of the recycling value chain, establish sustainable enterprises and expand existing businesses.

The Nigerian waste sector provides an important setting for examining these issues. Nigeria generates more than 35 million metric tonnes of solid waste annually, while a substantial proportion remains inadequately managed. Recent World Bank analysis indicates that waste segregation, formal collection and recycling rates remain low, despite increasing policy attention to waste recovery and circular-economy development. Lagos State has made comparatively greater progress in modernizing municipal solid waste management, but significant infrastructural and institutional challenges remain (World Bank, 2024).

For this study, Lagos is particularly important because of its population concentration, economic activity and large volume of waste generation. The

Lagos State Waste Management Authority (LAWMA) reported that the state generates approximately 13,000 tonnes of waste daily, creating both a major environmental challenge and a substantial economic opportunity for waste recovery and recycling enterprises (LAWMA, 2024). The scale of the waste stream creates opportunities for entrepreneurship in activities such as collection, sorting, aggregation, plastic recovery, metal recycling, reuse, and resale. However, the existence of economic opportunities does not necessarily imply equal access to those opportunities.

This distinction is important because women involved in waste recycling are not a homogeneous group. Some are waste pickers, while others operate as collectors, aggregators, processors, traders, recyclers or owners/managers of micro and small enterprises. Their experiences may differ according to age, education, marital status, entrepreneurial experience, business size, access to finance, cooperative membership, access to markets, training, institutional support and location. Understanding these factors can help identify which constraints are most strongly associated with gender-based discrimination and therefore provide a more precise basis for policy intervention.

Evidence from Nigeria also demonstrated that women entrepreneurs face institutional and structural barriers. The International Labour Organization's assessment of women's entrepreneurship development in Lagos and Rivers States identified legal and regulatory conditions, gender-sensitive finance, business development services, market and technology access, and women's participation in policy dialogue as important conditions influencing women's ability to operate and grow businesses. The assessment further highlights gender-based violence as an important barrier to women's entrepreneurship development in Nigeria (ILO, 2022).

The study is apt for three reasons: First, it extends the literature on gender and informal waste economies by shifting attention from participation alone toward the determinants of discriminatory treatment. Second, it connects gender-based discrimination with women entrepreneurship and the development of the recycling sector, thereby broadening the analytical focus beyond waste picking. Third, the findings can inform gender-responsive waste-management and entrepreneurship policies in Lagos and Nigeria. This is consistent with the emerging policy emphasis on integrating gender equality into circular-economy and waste-management systems (UN Women, 2025).

The study is therefore divided into five sections. Section One gives the introduction, Section Two provides the literature review, Section Three presents the methodology employed by the study, Section Four presents the findings and discussion, and Section Five concludes the study, presents some recommendations, and suggestions for further studies

LITERATURE REVIEW

Concept of Waste Recycling Entrepreneurship

Waste recycling entrepreneurship refers to entrepreneurial activities through which individuals or enterprises collect, recover, sort, process, transform, trade or otherwise add economic value to discarded materials. It encompasses activities across different stages of the recycling value chain, including waste collection, aggregation, sorting, processing, resale and manufacturing using recovered materials. Within developing economies, these activities frequently occur within informal or semi-formal markets.

Waste recycling entrepreneurship is increasingly associated with the circular economy because it contributes to extending the useful life of materials and reducing the volume of waste requiring final disposal. The International Labour Organization emphasied recycling as an important component of circular employment, while recent global estimates indicate that circular activities provide employment to more than 120 million people worldwide (ILO, 2025).

In Nigeria, informal recycling activities constitute an important component of urban waste management. Oguntoyinbo (2012) described the informal waste-management system as encompassing unregulated activities involving waste collection, sorting, reuse, and recycling by individuals, families, groups and small enterprises. These actors provide environmental and socioeconomic functions while often operating outside formal regulatory and social-protection systems.

From an entrepreneurship perspective, recycling activities can provide relatively low-entry opportunities for self-employment and income generation. However, the ability to transform waste-related activities into sustainable enterprises depends on access to productive resources, technology, finance, markets, networks and institutional support. These conditions may not be equally available to women and men.

- ***Gender and the Informal Waste Economy***

Gender is a fundamental organizing principle in many informal economic activities. Women's and men's participation in informal employment can differ because of socially constructed expectations regarding appropriate occupations, mobility, household responsibilities, access to resources and physical work. The informal waste economy provides a particularly important context for examining these differences because many activities are physically demanding, spatially competitive, and characterized by weak institutional regulation.

Nzeadibe and Adama (2015) provided important evidence from Nigerian cities, demonstrating that the informal waste economy is characterized by gendered spaces and male dominance. Their findings suggested that women's participation is shaped not only by individual economic decisions but also by social norms, physical requirements, and unequal power relations. The study further emphasized that gender inequalities increase the vulnerability of women's informal livelihoods.

Gendered organization of waste work can influence women's access to different segments of the recycling value chain. Evidence from Lagos cities shows that men have historically dominated activities involving waste collection, recovery, transportation, aggregation and processing, whereas women tend to be concentrated in sorting and sales activities (Nzeadibe & Adama, 2015). The authors in their Lagos case study, Nzeadibe and Adama (2015) found that women had limited access to highly valuable recyclables such as scrap metal and were more likely to engage in the collection of plastics, which attracted lower prices. The authors further reported limited female participation in the more profitable scrap-dealing and intermediary segments of the recycling economy. These gendered patterns of occupational participation can restrict

women's control over recyclable materials, bargaining power, and access to higher-value entrepreneurial opportunities (Nzeadibe & Adama, 2015). More recent evidence from informal recycling systems in Africa similarly indicates that gender norms can place women in lower-paying and less-valued activities while men are more strongly represented in higher-value recycling roles (Ogando et al., 2017; Nzeadibe & Adama, 2015). Therefore, the problem is therefore not simply whether women participate in recycling but under what conditions they participate and whether they receive equal treatment and opportunities within the sector.

METHODOLOGY

The study adopts a cross-sectional research design to examine the determinants of gender-based discrimination experienced by women entrepreneurs operating in the waste recycling sector in Lagos State, Nigeria. A quantitative approach is employed because the primary objective is to identify and estimate the association between women's socioeconomic, entrepreneurial, financial, market and institutional characteristics and their likelihood of experiencing gender-based discrimination.

The unit of analysis is the individual woman entrepreneur engaged in waste recycling-related activities, including waste collection, sorting, aggregation, processing, recovery, recycling and trading of recyclable materials. The study focuses on women who actively participate in the waste recycling value chain and have sufficient experience of their business environment to report whether they have encountered discriminatory treatment.

Variable Measurement

Dependent Variable

The dependent variable is experienced gender-based discrimination. It is measured using a binary indicator based on the respondent's reported experience of discriminatory treatment because she is a woman. Respondents were asked whether they had experienced gender-based discriminatory treatment while undertaking waste recycling activities. The response is coded as:

Experience gender-based discriminatory treatment= 1

No gender based-discriminatory treatment/Otherwise= 0

The study identifies some specific forms of discriminatory experience:

- denial or restriction of access to recyclable materials;
- exclusion from profitable recycling opportunities;
- receiving less favourable prices because of gender;
- exclusion from business networks or associations;
- restricted access to finance;
- exclusion from training or government support;
- harassment or intimidation;
- exclusion from decision-making;
- unequal treatment by buyers or suppliers; and
- unequal treatment by other actors in the recycling value chain.

Therefore, the binary outcome is coded as 1 if the respondent reports experiencing at least one form of the gender-based discrimination above and 0 otherwise.

Explanatory Variables

The explanatory variables are selected based on the literature on women's entrepreneurship, gender inequality and informal waste economies.

Table 1: Variable Code and Measurement

Factor	Variable	Variable Code	Measurement
Social factors	Age	age	Years
	Education	Edu	Formal Education =1 No formal Education
	Marital status	MarSta	1 = married, 0 = otherwise
	Cooperative membership	CoMem	1 = member, 0 = non-member
	Social network	SocNet	1= Social Network 0 = No Social Network
	Spouse involvement	SpouInv	1 = involved, 0 = not involved
	Language barrier	Lag bar	1 = experiences language barrier, 0 = otherwise
Economic factors	Entrepreneurial experience	EntExp	Years in recycling business
	Business size	Buzsize	Number of workers/employees
	Monthly business income	BuzInc	Monthly income in Nigerian Naira
	Access to finance	AccFin	1 = access, 0 = no access
	Market access	MakAcc	1 = adequate access, 0 = inadequate access
	Access to recyclable materials	RecAcc	1 = adequate access, 0 = inadequate access
Institutional factors	Training	Trai	1 = received training, 0 = otherwise
	Institutional support	insti	1 = received support, 0 = otherwise
	Business registration	BusReg	1 = registered, 0 = unregistered
Environmental factors	Occupational safety	OccSaf	1 = adequate safety, 0 = inadequate safety
	Exposure to hazardous waste	Exphazwast	1 = high exposure, 0 = low/no exposure

Source:Author's Compilation, 2026

Econometric Analysis

Since the dependent variable is binary, a binary response model is appropriate. The data were estimated with a Logit regression model to examine the determinants of experienced gender-based discrimination.

Logit Model

$P_i = e^{wi} / 1+ e^{wi}$ (1)

P_i in equation (1) is denoted as the probability of women experiencing gender based violence in recycling sector

$1-P_i$ = The probability of women not experiencing gender based dicrimination in waste recyling sector.

The relationship beween dependent and independent variable is given as:

$W_i = \underline{\propto}_0 + \Sigma \underline{\propto}_i X_i + \mu_i$ (2)

W_i = is a function of n-explanatory variable (Xi)

Where $\underline{\propto}_0$ =intercept

$\underline{\propto}_i$ = Regression coefficient to be estimared

X_i = are the explanatory variables

μ_i =Error term

$1-P_i = 1/1 + e^{wi}$ (3)

Now, taking the ratio of the probability of women experiencing gender based discrimination to the probability of women not experiencing gender based-violence in waste recycling sector.

We have:

$P_i /1- P_i = 1 + e^{wi} / 1 + e^{-wi} = e^{wi}$ (4)

The equation on the left side of equation (4)

$\frac{Pi}{1-Pi}$, is the odd ratio of experiencing gender based discrimination by women in waste recycling sector

Therefore, taking the natural log of eq (4)

The log odds ratio will be given as

$Li = Ln (\frac{Pi}{1-Pi}) = Ln [e\underline{\propto}0 + \sum_{j=i}^{n} (\propto j Xij)] = W_i = B0 + \sum_{j=1}^{n} (\propto j Xij)$ (5)

Where Li is log of odd ratio in favour of women experiencing gender based-discrimination in income generating activities.

Therefore, given equation 5 above, the logit model for women experiencing gender discrimination in waste recycling sector can be stated as

$V_i = \underline{\propto}_0 + \underline{\propto}_1$ age + $\underline{\propto}_2$ Edu + $\underline{\propto}$3MarSta + $\underline{\propto}_4$ CooMem + $\underline{\propto}_5$ SocNet + $\underline{\propto}_6$ SpouInv

+$\underline{\propto}_7$Lagbar + $\underline{\propto}_8$ EntExp + $\underline{\propto}_9$Buzsize + $\underline{\propto}_{10}$BuzInc + $\underline{\propto}_{11}$AccFin+ $\underline{\propto}_{12}$MakAcc+ $\underline{\propto}_{13}$RecAcc + $\underline{\propto}_{14}$Train + $\underline{\propto}_{15}$Insti + $\underline{\propto}_{16}$BusReg + $\underline{\propto}_{17}$OccSaf + $\underline{\propto}_{18}$ExpHazwas (6)

V_i takes 1 for women entrepreneur experiencing gender based-discrimination in waste recycling activities as value and 0 as value for women not experiencing gender based discrimination in waste recycling activities.

Ethical Considerations

Participation in the study is voluntary. Respondents are informed about the purpose of the research and their right to decline participation or withdraw from the study. Informed consent is obtained before questionnaire administration.

Because questions concerning discrimination, harassment, and unequal treatment may be sensitive, respondents are not required to provide personally identifying information beyond what is necessary for the research. Data are kept confidential and used exclusively for academic purposes. Findings are reported in aggregate form so that individual respondents and enterprises cannot be identified.

Analytical Software

Data are coded and cleaned before statistical analysis with Stata. Descriptive statistics are used to summarize respondents' socioeconomic and entrepreneurial characteristics. Inferential analysis is conducted using Logit regression models.

FINDINGS AND DISCUSSION

Demographic Analysis

Table 2 presents the demographic characteristics of the 284 women waste recyclers in the study areas.

Table 2: Demographic information of the women waste recyclers

Variables	Frequency	Percentage
Age (years)		
18- 27	67	**23.6**
28-37	126	**44.4**
38-47	58	**20.4**
48-57	28	**9,9**
57 and above	05	**1.8**
Education:		
formal Education	95	33.5
No Formal Education	189	66.5
Marital Status:		
Single	175	61.6
Married	109	38.4
Working/ Engage in other income activities:		
Yes	134	47.2
No	150	52.8
Spouse involvement in Recycling:		
Yes	68	**23.9**
No	216	**76.1**
Business Experience:		
>1 years	47	16.5
1year -2 years	110	38.7

3 years-4 years	84	29.6
5years -6 years	34	12.0
Above 6 years	9	3.2

Source : Authors Compilation, 2026

Table 2 indicates that majority of the respondents are young in middle-aged. The largest group is aged 28-37 years (44.4%), followed by those aged 18-27 years (23.6%) and 38-47 years (20.4%). Together, women aged 18-37 make up about 68% of the sample. Only 9.9% are aged 48-57 years and 1.8% are 58 years or older, which suggests that waste recycling is mainly an occupation of women in their economically active years, with few older women participating.

In terms of education, about two-thirds of the women (66.5%) have no formal education, while only 33.5% have some formal education. This suggests that waste recycling is an accessible source of livelihood for women with limited educational qualifications, because it requires few formal entry requirements.

Furthermore, majority of the respondents are single (61.6%), while 38.4% are married. Most of the women are therefore likely to be the primary or sole earners in their households as indicated in Table 2. The respondents are almost evenly split in terms of income activities, and this is represented in Table 2 as 47.2% are engaged in other income-generating activities alongside recycling, while 52.8% rely on recycling alone. This shows that more than half depend entirely on waste recycling for their income, while nearly half diversify their income sources.

In terms of spouse involvement in waste recycling activities, most of the women (76.1%) do not have their spouses involving in the recycling business, and only 23.9% do. This suggests that the women largely operate independently of family labour or support in the business.

For business experience, most of the women are in the early stages of their recycling careers. About 16.5% have less than 1 year of experience, 38.7% have 1-2 years, and 29.6% have 3-4 years. Altogether, about 85% have operated for four years or less. Only 12.0% have 5-6 years of experience and 3.2% have more than 6 years. This indicates either a recent influx of women into the sector or high turnover among long-serving recyclers.

Logit Regression of the Determinants of Women's Experience of Gender-Based Discrimination

Table 3 presents the results of the binary logistic regression on the factors associated with women's experience of gender-based discrimination in the waste-recycling sector in Lagos State, Nigeria.

Table 3: Logistic Regression Estimates of Factors Associated with Women's Experience of Gender-Based Discrimination

Factor	Variable	Code	Coefficient	Std. Error	z	p-value	Odds Ratio
Social Factors	Age	age	-0.4421	0.1196	-3.70	<0.001***	0.643
	Education	Edu	-0.4407	0.1713	-2.57	0.011**	0.644
	Marital status	MarSta	-0.0781	0.0152	-5.14	<0.001***	0.925
	Cooperative membership	CooMem	-0.0793	0.0183	-4.32	<0.001***	0.924
	Social network	SocNet	-0.1404	0.1228	-1.14	0.253	0.869
	Spouse involvement	SpouInv	-0.0362	0.0128	-2.83	0.005***	0.964
	Language barrier	Lagbar	0.0389	0.1868	0.21	0.835	1.040
Economic Factors	Entrepreneurial experience	EntExp	-0.0925	0.0233	-3.96	<0.001***	0.912
	Business size	Buzsize	-0.0574	0.0372	1.54	0.122	0.944
	Monthly business income	BuzInc	-0.1348	0.1238	1.09	0.276	0.874
	Access to finance	AccFin	-0.0919	0.0340	-2.70	0.007***	0.912
	Market access	MakAcc	-0.4238	0.1215	-3.49	<0.001***	0.655
	Access to recyclable materials	RecAcc	-0.3760	0.1224	-3.07	0.002***	0.687
Institutional Factors	Training	Train	1.3978	0.3088	4.53	<0.001***	4.048
	Institutional support	Insti	-0.0030	0.0074	-0.40	0.690	0.997
	Business registration	BusReg	-1.3978	0.3088	-4.53	<0.001***	0.247
Environmental Factors	Occupational safety	OccSaf	-0.7367	0.4276	-1.72	0.085*	0.479
	Exposure to hazardous waste	ExpHazwast	0.1404	0.1228	1.14	0.253	1.151

Notes: OR = e^{β}. *** p < 0.01, ** p < 0.05, * p < 0.10. Dependent variable: experienced gender-based discrimination (1 = Yes; 0 = Otherwise).

From Table 3, the dependent variable was coded 1 if a woman reported experiencing gender-based discrimination and 0 otherwise. The explanatory variables were grouped into social, economic, institutional, and environmental factors. The coefficients were transformed into odds ratios (ORs) to facilitate interpretation.

The logistic regression results indicate that several social, economic, institutional, and environmental variables are statistically associated with women's reported experience of gender-based discrimination in the waste-recycling sector.

Social Factors

Age (age)

The age variable which is denoted as age of the respondents in years is negatively and significantly associated with women's experience of gender-based discrimination (OR = 0.643, $p < 0.001$). Holding other factors constant, a one-unit increase in age is associated with approximately 35.7% lower odds of reporting gender-based discrimination. This finding suggests that older women in the waste-recycling sector may have accumulated greater experience, social connections, knowledge of the business environment, and bargaining capacity, which may reduce their exposure to discriminatory practices. The result is consistent with the broader literature showing that gendered relations and power structures shape participation and opportunities in Nigeria's informal waste economy. Nzeadibe and Adama (2015), for example, documented gendered spaces and unequal participation in Nigeria's informal waste economy, particularly where access to physically demanding activities, workspaces, and valuable waste streams is influenced by gendered social relations.

Education (Edu)

The variable educational coded as Edu in Table 1 has a statistically significant negative relationship with women experiencing gender-based discrimination (OR = 0.644, $p = 0.011$). The odds ratio depicts that a one-unit increase in education is associated with approximately 35.6% lower odds of experiencing gender-based discrimination by women, ceteris paribus. Education may improve women's knowledge of their rights, business practices, institutional procedures, negotiation skills, and ability to access formal business networks. Consequently, educated women may be better positioned to identify discriminatory practices and negotiate access to business opportunities. This result supports the broader women-entrepreneurship literature, which emphasizes the importance of business development support and access to resources in enabling women entrepreneurs to operate and grow on more equal terms. The ILO's assessment of women's entrepreneurship development in Nigeria similarly identifies access to business development services, markets, technology, finance, and representation as important dimensions of the entrepreneurial environment. In line with the findings, studies have observed that high level of education help women to have better understanding of pro-

environmental values and proper waste disposal (Escario et al., 2020; Uma et al., 2020)

Marital status (MarSta)

The variable marital status represented as MarSta is negatively and significantly associated with gender-based discrimination (OR = 0.925, $p < 0.001$). With married as the reference category, this indicates that women that are married have 7.5% lower odds of reporting discrimination relative to those that are not married. This finding indicates that family and household relationships can provide social, economic, or informational support that enhances women's capacity to participate in recycling activities.

Cooperative membership (CoMem)

The cooperative membership variable which is represented as CoMem in Table 1 is also negatively associated with reported discrimination and is statistically significant at 1% (OR = 0.924, $p < 0.001$). This indicates that being a member of a cooperative is associated with approximately 7.6% lower odds of experiencing discrimination. Cooperatives can provide women with collective bargaining capacity, information, social networks, access to recyclable materials, and a stronger voice in the recycling market. This finding is particularly important in a sector where informal rules and unequal access to workspaces and materials can influence women's economic opportunities. Nzeadibe and Adama (2015) observed that the Nigerian informal waste economy is characterized by gendered participation and unequal access to organizational and economic spaces.

Spouse involvement (SpouInv)

Spouse involvement in recycling activities denoted as *SpouInv* in Table 3 *is* negative and statistically significant (OR = 0.964, $p = 0.005$). This indicates that a one-unit increase in spouse involvement is associated with approximately 3.6% lower odds of experiencing gender-based discrimination. This suggests that household-level support in the area of husband involvement in business activities embark by their wife may strengthen woman's ability to participate in recycling entrepreneurship and negotiate discriminatory situations.

Social network (SocNet)

The variable social network variable coded as SocNet in Table 1 In contrast to spouse involvement variable, is not statistically significant (OR = 0.869, $p = 0.253$), while this may be the fact that women engaging in waste recycling activities are not actively involved in social network which could be due to inadequate leisure time as they have domestic and reproductive responsibilities carried out

Language barrier (Lagbar)

The language barrier variable denoted as Lagbar in Table 3 is also statistically insignificant (OR = 1.040, $p = 0.835$). Although the signs suggest lower odds associated with social networks and slightly higher odds associated with language barriers, the evidence is insufficient to conclude that these variables are systematically associated with women's reported experience of discrimination in this sample.

Economic Factors

Entrepreneurial Experience (EntExp)

Among the economic variables, entrepreneurial experience denoted as (EntExp) is negatively and significantly associated with gender-based discrimination (OR = 0.912, $p < 0.001$). Each additional year of entrepreneurial experience is associated with approximately 8.8% lower odds of reporting discrimination. This is because experienced women may have developed stronger relationships with suppliers, customers, waste collectors, buyers, and other market participants, thereby increasing their ability to negotiate prices and secure business opportunities. Experience may also enable women to understand informal rules governing access to recyclable materials and markets.

Access to finance (AccFin)

is negatively and significantly associated with discrimination (OR = 0.912, $p = 0.007$). Women with access to finance have approximately 8.8% lower odds of reporting discrimination, assuming the variable is coded as a one-unit change in access to finance. Financial access may allow women to operate more independently, purchase recyclable materials directly, acquire equipment, employ workers, and negotiate from a stronger economic position. This finding is consistent with ILO (2022) in their assessment of women's entrepreneurship development in Nigeria, which identified access to gender-sensitive financial services as one of the key conditions affecting women's ability to establish and grow sustainable enterprises. The assessment also reported barriers such as collateral requirements, limited guarantors, high interest rates, and short repayment periods. Another anecdotal evidence observed that women who received less income as waste pickers are prone to less opportunities to valuable recyclables, equipment, and vehicle (Aidis & Khaled,2019)

Market access (MakAcc)

has a statistically significant negative relationship with reported discrimination (OR = 0.655, $p < 0.001$). The odds ratio indicates approximately 34.5% lower odds of experiencing discrimination among respondents in the relevant market-access category. This is one of the stronger economic associations in the model. Better market access may reduce women's dependence on individual buyers or intermediaries and give them greater choice in determining where and to whom recyclable materials are sold. The result is particularly relevant to Lagos, where recent evidence has documented gendered competition over access to waste-picking spaces and recyclable materials.

Access to recyclable materials (RecAcc)

Similarly, access to recyclable materials is negatively and significantly associated with gender-based discrimination (OR = 0.687, $p = 0.002$). The result suggests approximately 31.3% lower odds of reporting discrimination for the relevant category. Access to recyclable materials is central to the viability of recycling enterprises because inadequate or restricted access can limit business scale, revenue, and participation in profitable segments of the value chain. The finding therefore supports the argument that discrimination may be embedded not only in interpersonal interactions but also in the distribution and control of productive resources.

This result is particularly consistent with recent qualitative evidence from Lagos. Nnanwube and Olutayo (2026), studying women and men waste pickers at two Lagos landfill sites, identified gendered working rules, competition over picking spaces, physical violence, gendered divisions of waste, and other structural barriers affecting women's participation. Similarly, studies have observed gender-based discrimination in ganning access to landfills, materials and equipment (Dias and Fernandez 2012; Nnanwube 2025; Samson 2022)

Business Size (Buzsize)

The variable business size of the respondents represented as *Buzsize* in Table 3 is not significant even at 10% (OR = 0.944, $p = 0.122$). This indicates that the size of the business of the waste recycler has no impact on the probability of witnessing gender-based discrimination in the recycling activities.

Monthly Business Income (BuzInc)

Also, monthly business income of the respondents depicted as BuzInc in Table 3 (OR = 0.874, $p = 0.276$) is not statistically significant. Although their estimated odds ratios are below one, the statistical evidence does not establish a significant association with reported gender-based discrimination. This suggests that simply operating a larger business or earning a higher monthly income may not, by itself, eliminate gender-related barriers within the recycling sector.

Institutional Factors

Training (train)

The institutional variables produce mixed results. Training has a strong positive and statistically significant association with reported gender-based discrimination (OR = 4.048, $p < 0.001$). Respondents in the relevant training category have approximately 4.05 times the odds of reporting discrimination compared with the reference category.

At first glance, this finding may appear counterintuitive because training is normally expected to improve women's entrepreneurial capacity. One possible explanation is that training may be reaching women who are already more active, visible, or exposed to competitive segments of the recycling value chain. Training may also increase women's participation in activities where discriminatory practices are more visible.

The result nevertheless provides an important policy insight: training programmes should not focus exclusively on technical or entrepreneurial skills. They should also incorporate gender equality, rights awareness, negotiation, occupational safety, conflict management, access to finance, market linkage, and mechanisms for reporting discriminatory treatment. The ILO's Nigerian women-entrepreneurship assessment emphasizes business development services, finance, market access, technology, policy coordination, and women's representation as interconnected conditions for women's enterprise development.

Institutional support (intil)

Institutional support as represented by Intil in Table 3 is not statistically significant (OR = 0.997, $p = 0.690$). This indicates that the measured form of institutional support does not have a statistically detectable association with women's reported experience of discrimination in this model. This may reflect limited reach, uneven implementation, or the possibility that existing support

programmes are not specifically designed to address gender-based barriers in recycling waste.

Business Registration (BusReg)

Business registration is presented as BusReg in Table 3 in contrast, business registration is strongly and negatively associated with reported discrimination (OR = 0.247, $p < 0.001$). This shows that businesses that are registered have 75.3% lower odds of experiencing discrimination relative to the non-registered business. Formalization may provide women with greater visibility, documentation, legitimacy, access to formal markets, institutional recognition, and avenues for complaint or dispute resolution. The finding aligns with the ILO's emphasis on enterprise formalization as an important component of improving conditions for women-owned enterprises in Nigeria.

However, formal registration should not automatically be interpreted as protection from discrimination. The relationship may partly reflect selection, since women with stronger enterprises and greater resources may be more likely to register their businesses in the first place.

Environmental Factors

Occupational (OccuSaf)

Occupational safety has a negative association with reported discrimination (OR = 0.479, $p = 0.085$). At the 10% significance level, respondents reporting adequate occupational safety have approximately 52.1% lower odds of experiencing discrimination. Although the result is weaker than those observed for several social and economic variables, it indicates that workplace conditions may be related to women's experiences in the sector.

The finding is relevant because waste-recycling activities expose workers to physical hazards and unsafe working conditions. The recent Lagos study by Nnanwube and Olutayo (2026) similarly identifies physical violence and the physically demanding character of landfill waste picking as important dimensions of the gendered barriers experienced by women. Furthermore, security issues and sexual molestation have been observed to increase gender discrimination at dumpsites (Aidis and Khaled 2019; Blaauw, Pretorius, and Viljoen 2020; Onesmo 2023).

Exposure to hazardous waste (ExpHazwast)

Exposure to hazardous waste denoted as ExpHazwast is not statistically significant (OR = 1.151, $p = 0.253$). Although the estimated odds ratio is greater than one, suggesting higher reported odds in relation to exposure to hazardous waste relevant category, however the variable does not give a statistically significant result.

Overall Discussion of the Findings

Overall, the results demonstrate that women's experience of gender-based discrimination in Lagos's waste-recycling sector is associated with a combination of social resources, economic resources, institutional characteristics, and working conditions rather than with a single factor. The statistically significant negative associations for age, education, cooperative membership, spouse involvement, entrepreneurial experience, access to finance, market access, access to recyclable materials, and business registration indicate that women's access to knowledge,

networks, productive resources, market opportunities, collective organization, and formal business structures is potentially important in understanding their reported experiences of discrimination.

The findings reinforce the argument that gender inequality in the waste economy is embedded within the organization of work and access to economic spaces. Nzeadibe and Adama (2015) showed that Nigeria's informal waste economy is characterized by gendered divisions of labour and unequal participation, while the recent Lagos evidence of Nnanwube and Olutayo (2026) demonstrates that these issues remain relevant, with gendered working rules, competition over waste resources and workspaces, and physical violence affecting women waste pickers.

The economic findings are also consistent with the wider Nigerian women-entrepreneurship evidence. The ILO (2022) assessment of Lagos and Rivers States identified finance, business development services, market and technology access, formalization, and women's representation as important components of the entrepreneurial ecosystem. Thus, addressing gender-based discrimination in waste recycling requires more than encouraging women to enter the sector. Interventions need to improve women's control over productive resources, access to markets, collective organization, business formalization, and institutional voice.

An important finding is the positive relationship between training and reported discrimination. Rather than being interpreted as evidence against training, this result suggests that training programmes should be designed as part of a broader gender-responsive entrepreneurship strategy. Training without access to finance, markets, recyclable materials, protective equipment, formalization support, and mechanisms for addressing discriminatory treatment may have limited capacity to change the structural conditions under which women operate.

CONCLUSION

This study examined the factors associated with women's experience of gender-based discrimination in the waste-recycling sector in Lagos State, Nigeria, using a binary logistic regression framework. The findings demonstrate that gender-based discrimination is associated with interconnected social, economic, institutional, and environmental conditions within the recycling business environment.

The results show statistically significant associations for age, education, marital status, cooperative membership, spouse involvement, entrepreneurial experience, access to finance, market access, recyclable materials, training, business registration, and occupational safety at the relevant significance levels. In particular, education, cooperative membership, entrepreneurial experience, access to finance, market access, access to recyclable materials, and business registration were associated with lower odds of reported discrimination. Training, in contrast, was positively associated with reported discrimination, while social network, language barrier, business size, monthly business income, institutional support, and exposure to hazardous waste were not statistically significant.

The findings suggest that gender-based discrimination in Lagos's waste-recycling sector should not be viewed solely as an interpersonal problem. Rather, it is connected to women's access to productive resources, markets, institutional structures, collective organizations, and safe working conditions. This interpretation is consistent with evidence that Nigeria's informal waste economy is characterized by gendered spaces and unequal participation, as well as recent Lagos research documenting structural gender barriers among women waste pickers.

The study therefore concludes that reducing gender-based discrimination requires a multidimensional approach to women's empowerment in the waste-recycling value chain. Policies should combine gender-responsive finance, market access, access to recyclable materials, cooperative organization, business formalization, appropriate training, occupational safety, and women's participation in decision-making. Such interventions can strengthen women's economic agency while contributing to a more inclusive and sustainable waste-recycling economy in Lagos.

RECOMMENDATIONS

Based on the empirical findings, the following recommendations are proposed.

Establish gender-responsive financing mechanisms

Financial institutions, government agencies, and development organizations should establish or expand financing schemes specifically accessible to women waste-recycling entrepreneurs. Financing mechanisms should reduce excessive collateral requirements, provide appropriate repayment periods, and consider alternative forms of credit assessment suitable for informal and micro-scale recycling enterprises. The ILO (2022) Nigerian assessment identifies access to gender-sensitive financial services as a critical component of women's entrepreneurship development.

Improve women's access to recycling markets

Given the significant negative association between market access and reported discrimination, policies should facilitate direct linkages between women recycling entrepreneurs and recycling companies, manufacturers, aggregators, institutional buyers, and public procurement opportunities. Women should be incorporated into formal recycling supply chains rather than remaining concentrated in less profitable segments of the value chain.

Improve access to recyclable materials

Lagos State waste-management stakeholders should develop transparent and gender-inclusive arrangements governing access to recyclable materials, collection points, transfer stations, and other waste-recovery locations. Allocation systems should avoid informal practices that exclude women from high-value materials or commercially attractive locations. This recommendation is particularly relevant given recent evidence of gendered competition over waste-picking spaces and recyclable materials in Lagos.

Strengthen women-led cooperatives and collective organizations

The significant relationship between cooperative membership and lower odds of reported discrimination indicates the potential importance of collective organization. Women recycling entrepreneurs should be encouraged to establish or join cooperatives that provide collective purchasing, marketing, savings and credit, information sharing, skills development, advocacy, and negotiation with buyers and government institutions.

Make entrepreneurship training explicitly gender-responsive

The positive association between training and reported discrimination indicates that training programmes require careful redesign rather than simple expansion. Training should include not only technical recycling skills but also gender rights, negotiation, financial literacy, market development, digital skills, leadership, occupational safety, conflict resolution, and mechanisms for reporting discrimination. Training providers should also monitor whether participants subsequently gain access to finance, markets, materials, and business opportunities.

The ILO's guidance on gender-inclusive business development services supports the principle that services for women entrepreneurs should be deliberately designed around women's specific constraints rather than simply providing identical services to men and women.

Promote business formalization among women recycling entrepreneurs

The strong negative association between business registration and reported discrimination suggests that formalization may be an important pathway for improving women's institutional recognition and access to support. However, registration should be accompanied by practical benefits, including access to finance, markets, training, technology, waste-collection opportunities, and institutional protection. Formalization should therefore be simplified and made affordable for micro and small women-owned recycling businesses. The ILO has specifically recommended mechanisms to simplify access to business development services and enterprise formalization for women entrepreneurs in Nigeria.

Strengthen occupational safety and protection

Lagos waste-management authorities, recycling companies, cooperatives, and development organizations should strengthen occupational health and safety measures for women recyclers. Interventions should include appropriate personal protective equipment, safe sorting and processing facilities, health and safety training, first-aid provisions, and mechanisms for reporting physical harassment or violence.

Increase women's representation in recycling governance

Women should have meaningful representation in waste-picker associations, recycling cooperatives, community waste-management committees, and relevant policy-making structures. Representation should extend beyond welfare-oriented positions to leadership roles involving access to workspaces, recyclable materials, pricing, contracts, and organizational resources. Earlier evidence from Nigeria shows how gendered organizational structures can reproduce unequal participation in the waste economy.

Establish a gender-discrimination reporting and redress mechanism

A confidential and accessible complaint mechanism should be developed for women working in the recycling sector. Such a mechanism could operate through cooperatives, local government structures, waste-management agencies, or designated gender desks. Complaints concerning exclusion from recyclable materials, discriminatory pricing, harassment, intimidation, violence, or exclusion from business opportunities should be documented and addressed through transparent procedures.

Integrate gender equality into Lagos's circular-economy strategy

Gender equality should be incorporated explicitly into policies promoting recycling, circular economy, plastic recovery, and green employment. Women should be treated not merely as beneficiaries of waste-management programmes but as entrepreneurs, investors, employers, innovators, and value-chain actors. This approach would help ensure that the transition toward a circular economy does not reproduce existing gender inequalities.

Suggestion for further studies

Future studies should use longitudinal or panel data to establish temporal relationships between women's access to resources and subsequent experiences of discrimination. Qualitative studies should also investigate how discrimination operates in specific parts of the recycling value chain, including collection, sorting, aggregation, processing, trading, and upcycling. Future research could additionally examine interactions between gender, age, education, business formality, access to finance, and type of recyclable material. Mixed-methods research combining logistic regression with interviews and focus groups would provide a more comprehensive understanding of the mechanisms underlying the observed statistical relationships.

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