EFFECT OF AGRICULTURAL COOPERATIVE MEMBERSHIP ON WILLINGNESS TO PAY FOR NON-FATAL RISK REDUCTION FROM COVID-19

ABSTRACT

The study determined the willingness to pay for health risk reduction from Corona Virus (COVID-19); estimated the value of statistical case (VSC) and ascertained the effects of cooperative membership on the willingness to pay (WTP) for COVID-19 morbidity health risk reduction. Multi-stage sampling technique was deployed in selecting 149 cooperative and 130 non-cooperative members for the study, in Edu and Patigi Local Government Areas of Kwara State, Nigeria. To reach its conclusion, descriptive statistics, Levene's test, t-test, chi-square, Probit analysis, propensity score matching, WTP and the value of statistical case were employed for data analysis. The study revealed that the typical cooperative member is willing to pay ₦1,638 per farming season to decrease his or her chance of falling sick from COVID-19 or averting non-fatal cases of COVID-19 by 1 in 10,000. In addition, the propensity score matching (PSM) estimation indicated that agricultural cooperative societies had effect on members, with the average member willing to pay ₦561.32 per season higher than the non-members. Arising from these results, it becomes imperative to consider integrating cooperative society as complementary instrument for the prevention and control of COVID-19 pandemic. The estimated VSC further provides pecuniary basis and policy guidance for efficient allocation of resources for the mitigation and control of COVID-19.

***Key words**:*
Benefit-cost analysis,
Willingness to pay,
Value of statistical case,
Health risk reduction,
COVID-19

1.0 INTRODUCTION

The concerns about the incidence of COVID-19 across the globe, including Nigeria heightened recently, with the discovery of the Omicron variant in the country. This development does not come as a surprise, given that researchers like [21]; [10] predicted the likelihood of growing incidence or resurgence of the pandemic against the backdrop of the under-developed socio-economics, the difficulties in prevention and impromptu lifting of mitigation measures. According to [7], the incidence of COVID-19 rose from a minimum of zero case per million in February 2020 to a maximum of 1,142 cases per million in December, 2021, representing an increase of over 1,000 folds and an average value of 535 per million persons in Nigeria. Worthy of note is that the maximum estimate for Nigeria was higher than those obtained in Niger (295), Mali (1,007), Liberia (1,212), Democratic Republic of Congo (810), Chad (337), Burkina Faso (820) and Sudan (1,036). In absolute terms however, the Nigeria Centre for Disease Control (NCDC) (2022) confirmed 251,959 cases, 22,889 active cases and 3,124 deaths, from the pandemic as at January 23, 2022.

Towards combating the pandemic, numerous interventions have been implemented by government designated institutions. These included awareness creation, preventive policies, including use of face masks and hand sanitizers, social distancing, restriction of movement and travels, restriction of social gathering, closure of offices and commercial centers. In addition to these public interventions, individuals on their part, have depended on personal coping and mitigation measures across the country. Ironically, these mitigations and coping measures could not prevent reoccurrences, while not relegating their efficacies or usefulness. Thus, it was in the light of these occurrences that [15] noted that during a systemic shock, where idiosyncratic risk coping strategies fail, collective or organizational resilience becomes imperative to protect the livelihoods of smallholders. Thus, in general, while the effect of the pandemic on comparative activities was evident, few institutions with organizational and managerial capacities demonstrated resilience. Aside arguing that economy-wide shocks require collective adaptation and organizational change or innovation, the study argued that the comparative advantage of cooperative enterprises was their higher resilience.

With respect to the cooperative associations, [11] affirmed that estimated 1 billion people were involved in cooperatives, as either members, employees or customers. The global institutions revealed that cooperatives employ at least 100 million people worldwide and that, the livelihood of nearly half of the world's population are secured by cooperative activities. Aside their economic mandates, it was further established that cooperatives ensure healthy lives, by creating infrastructure for delivering health care services, financing health care, while providing home-based health care services. Cooperatives were also noted for their contributions to sustainable development, social and environmental objectives.

Though, the conceptual understanding of the terminology varies, essentially, cooperatives are legal and voluntary entities, comprising individuals of similar interest, who aspire to achieve some economic, social gains and cultural needs through joint ownership and democratic tenets [11]. In Nigeria, the emergence of cooperative movement is associated with the enactment of the Nigerian Ordinance of Cooperative Societies in 1935 [6]; not precluding the fact that the adoption of the Israeli modelled farm settlement schemes in some parts of the country in the mid to late-50s, concretized cooperative movement. However, cooperative movement have since witnessed numerous transformation, including portfolio diversification, in line with global dynamics, policy and regulatory demands.

Arising from this background, and the concerns on the specific roles of cooperatives in the fight against the COVID-19 pandemic, this study was conceptualized to ascertain the effect of agricultural cooperatives on members' willingness to pay for morbidity risk reduction arising from COVID-19. Specifically, the study: estimated the willingness to pay for COVID-19 morbidity risk reduction by cooperative and non-cooperative rice farmers; ascertained the value of statistical case as a result of the virus and determined the effect of cooperative membership on the WTP for COVID-19 health risk reduction.

This study becomes apt as it systematically looks into the activities and collective resilience demonstrated by agricultural cooperative societies with respect to the COVID-19 pandemic and their effects on members. Aside this, the study contributes to the growing body of literature on smallholder farmers' health risk valuation and their value of statistical case with regards to COVID -19 morbidity. Moreover, studies of this nature are few in Africa, particularly in sub-Saharan Africa. The study hypothesized that agricultural cooperative societies may not have an effect on rice farmers' WTP to pay for morbidity health risk reduction from COVID-19.

2.0 THEORETICAL DISCOURSE AND RELATED LITERATURE

2.1 Theoretical Discourse

The study is premised on tripartite theoretical base, covering the welfare economics theories of WTP, health reduction related risk theories and the theories of cooperative advantage and resilience. On the flip side, the focus on WTP was on the theories of public good and planned behavior. The theory of public good became imperative given that the control of COVID-19 pandemic is a public good, which the state or institutions have control over. According to [3], many researchers trace the origin of the global public good to the rational choice behavior. The researchers noted that success within a public good depends on resilience and capacity of the system to absorb disturbance and reorganize while undergoing change. It was further noted that the main collective action issues connected with public good is free-riding, because consumption is free, actors want to benefit from collective good, but are reluctant to pay.

However, the theory of public good was noted to have created models used in explaining provision and consumption issues for numerous non-excludable goods. [5] on their part, argued that health, as a public good should be defined by a broader conception of public goods, tagged normative public goods. The researchers noted that the success in managing public goods depends on the resilience of the system, that is, the capacity of the system to absorb disturbance and reorganize, while undergoing change. In a related development, [4] affirmed that free-rider problem is severe, particularly with social distancing in the light of the COVID-19 control. They argued that the management of the pandemic requires the resolution of a collective action problem, where the lack of alignment between individual incentives and common objectives produces socially optimal outcomes. Thus, the authors argued that social and psychological mechanisms can mitigate the collective-action problem. Substantiating further, the researchers argued that psychology and economics have demonstrated that people care about others and further supporting their arguments with the empathy-altruism hypothesis that suggests that people have intrinsic motivation to help others because of empathy or the incorporation of the utility of others into one's own utility function. This theoretical foundation resonates with the theory of cooperative movement and is clearly relevant to the context of COVID-19 morbidity risk reduction.

The theory of planned behaviour (TPB) also finds a place under the WTP framework. TPB is generally concerned with the prediction of intentions. It specifically emphasizes controlled aspect of human information, processing and decision making. It was further noted that behavioral, normative and control beliefs, as well as attitudes, subjective norms and perceptions of behavioral control are assumed to feed into and explain behavioral intentions [1]. The researcher noted that TPB is mainly concerned with behaviour that are goal directed and steered by conscious self-regulatory processes, rather than an impassionate, rational actor who reviews all available information in an unbiased fashion to arrive at a behavioral decision.

Specifically, with respect to the relationship between WTP and TPB, Ajzen's seminal review argued that the reasoned actioned processes of the TPB are only a possible path to arriving at a behaviour. According to the researcher, the alternative path is more spontaneous, reactive on the current scenario and hugely influenced by perceived similarity to a behavioural prototype. The argument was that, unlike TPB, which is largely premised on reasoned action, WTP is influenced by communal or group actions. While revealing that the TPB is widely accepted and backed up with empirical studies, [1] affirmed that the WTP analytical framework can be accommodated within the TPB theoretical framework. According to the researcher, the determinant of behaviour is associated with individual's behavioural, normative and control beliefs. Background factors that may influence beliefs include socio-demographic factors such as personality, values, education, age, gender, income, exposure to information, among others.

With respect to the theories of health risks, the study finds relevance in the work of [21], as deployed by [16]. The researcher /categorized risks according to their intensity and knowledge of existence and effect, as either dreaded or unknown. The former included risks that cannot be controlled, with catastrophic potentials and fatal consequences, while the latter covers risks that are unobservable, unknown, new and delayed in manifestation to harm. Most of these attributes were noted to be associated with COVID-19 risks. Thus, these categorizations clearly resonate with the risk valuation mechanism under the WTP and value of statistical life (VSL) theoretical framework and of course, finds application in this study. This framework will provide the relevant background for risk valuation, derivation of the value of statistical case (VSC) and the conduct of sensitivity analysis based on risks categorization.

Meanwhile, in reaffirming the empirical applicability of the theory of cooperative advantage and resilience, [2] provided a theoretical background of how the theories of cooperative advantage and resilience enhanced the operations of the cooperatives towards supporting the COVID-19 crisis. The study affirmed that the sustainability of cooperative operations can enhance economic resilience, thus making the cooperatives more adaptable and capable of absorbing economic shock. The study opined that cooperatives are set-up to serve members' needs, even during periods of crisis and uncertainty. In addition, it was argued that the resilience and cooperative advantage inherent in the system, prompted numerous cooperatives to take up additional services beyond their mandates during crisis situation. The research cited instances where cooperatives set up COVID-19 units, consisting of numerous members who took care of discharged patients. In addition, the study noted that during the COVID 19 crisis, cooperatives supported each other and created new partnerships for delivering additional responsibilities to members.

2.2 Conceptual Discourse and Health Risk Reduction Valuation Framework

The WTP approach is consistent with the overall benefit-cost analysis framework, which assumes that individuals are the best or most legitimate judge of their own welfare [16]. It was established that the value of an improvement, such as a decrease in the risk of dying or becoming ill, is premised on the individual WTP. According to them, the estimate represents the maximum amount of money affected individuals would exchange for the risk reduction they would experience, given their budget constraints and preferences for spending on other goods and services.

In a related development, VSL refers to the amount of money individuals are willing to exchange for small changes in their own risks within a period of time. It is worthy of mention that this value does not represent the amount the project analyst, researcher or the government places on saving an individual from certain death. Specifically, with respect to health risk reduction from morbidity or non-fatal risk, WTP is the amount of money an individual is WTP to reduce the risk of being infected by or averting non-fatal case by at a determined risk level. According to the researchers, the conceptual framework for valuing morbidity risk reduction is similar to that of the mortality risk reduction. For the former, which is the focus of this research, focus is on individual's willingness to exchange income (wealth) for changes in his or her own risk of non-fatal illness. These estimates are expected to vary with the characteristics of individuals, risks and those of the value of statistical life. While the VSL applies to expected changes in fatalities, the value of statistical case (VSC) relates to changes in non-fatal illness.

Meanwhile, [9] noted that the valuation of risks reduction is associated with regulations or other policies that address COVID-19, such as; uncertainties related to the impact of the disease, characteristics of individuals most affected, its symptoms and duration, gaps and inconsistencies associated with available evaluation research. Approaches recommended for valuing non-fatal cases of illness, included WTP, Quality Adjusted Life Year (QALY), etc.

3.0 MATERIAL AND METHODS

3.1 Study Area

The study was undertaken in Edu and Patigi Local Government Areas (LGAs) of Kwara State, North Central region of Nigeria. The State covers an area of 36,825 km [12], with an estimated population of 3,671,535 as at 2021, going by 3% growth rate [13]. Kwara State share boundaries with the Republic of Benin to the West and Niger River to the North [12]. The State is headquartered in Ilorin, and is about 500km from the Federal Capital Territory. The economy of Kwara State is mainly agrarian, with farmers involved in both arable and cash crops, livestock herding and ranching [12]. Like in most states across the middle belt of Nigeria, rain-fed farming activities commences with the onset of the rains in April and terminates by October.

Edu LGA

Edu local government shares boundaries with Ifelodun in the South, in the East with Pategi, North by River Niger and Niger State respectively, with headquarters in Lafiagi [12]. It has an estimated area of 2,542 km² and a population of 168,3000 as at 2016; estimated at 198,594 using 3% growth rate [13]. Its major inhabitants are Nupes, Hausas and Yorubas [12].

Patigi LGA

Pategi local government was created from Edu Local Government Area with its headquarters in Pategi. Its population stands at 168,300 as at 2016 [13] and was estimated to 176,495, at 3% growth rate. It is populated by the Nupes, who exhibit a linguistic repertoire of the Yoruba dialect. The main occupations of inhabitants are farming, fishing and trading. The key crop grown, include; cassava, millet, rice, guinea corn, melon [12].

3.2 Sampling Techniques and Sample Size

The multi-stage sampling technique was employed to select respondents for this study. The first stage entailed the purposive selection of two local government areas (LGAs) (Edu and Pategi) out of the 16 LGAs in Kwara State. The two LGAs were selected, given their comparative advantage in rice production. The second stage involved the random selection of three communities from each of the LGAs; similarly, the third stage entailed the random selection of 25 each of cooperative and non-cooperative members from each of the three communities selected under the two LGAs. In all, 150 each of cooperative and non-cooperative members were sampled. However, 149 and 130 cooperative and non-cooperative members were interviewed, representing 99.3% and 86.7% achievements respectively.

3.3 Data Collection

Data for the study was from primary data covering the 2021 farming season. Farming activities starts in earnest in Kwara State with the onset of the rains around late March/April and terminates by October, 2021. Data were collected on the socio-demographic characteristics of the farmers, input and output data, membership of cooperative, group demography, cohesion and dynamics. income, COVID-19 related information, including the farmers' WTP for COVID-19 morbidity risk reduction.

3.4 Analytical Techniques

Various analytical techniques were used in achieving the objectives of this study. These are the descriptive statistics, Levene's test, t-test, chi-square, Probit analysis, propensity score matching, WTP and the value of statistical case. Statistical Packages for Social Scientists and Stata were used for data analysis.

3.5 Risk reduction valuation

The risk reduction framework was modelled in tandem with the logic for VSL analytics as deployed by [8] in Equation 1

$$U(p, w) = (1 - p)Ua\,(w) + \; PUd(w)$$
(1)

Where p represents the likelihood of falling ill as a result of COVID-19 infection during the current period and $Ua\,(w)$ and $Ud(w)$ represent utility as a function of wealth premised on not contacting COVID-19 and falling ill due to COVID-19 respectively. From the aforementioned background, the individual value of health risk reduction (VHRR) or the marginal rate of substitution between *p* and *w* was obtained by differentiating Equation 1 while the utility is held constant to obtain Equation 2.

$$VHRR = \frac{dw}{dp} = \frac{Ua(w) - Ud(w)}{(1-p)U'a(w) + PU'd(w)} \qquad (2)$$

The numerator in Equation 2 represents utility differentials with respect to if the agent avoids illness or falls ill due to COVID-19 in the current period. The denominator represents the expected marginal utility of wealth, which is the utility associated with additional wealth depending on the likelihood of not contacting COVID-19 and falling ill as a result of the pandemic, weighted by the probabilities of these events. It is worthy of mention that the VHRR also depends on the baseline risk and wealth like the VSL. As it is with the VSL, WTP for morbidity risk reduction will depend on the ability to pay and may likely increase with wealth.

3.6 Propensity score matching (PSM)

The PSM econometric technique was employed to determine the causal effect of agricultural cooperative on members' willingness to pay for COVID-19 morbidity risk reduction. The PSM was used to construct the best comparable group with similar characteristics with the treatment group. From the application of the model by [17], the PSM can be used to address the challenges of self-selection bias through matching between cooperative and non-cooperative members. In addition, [18] affirmed that impact estimation based on matched sample is less biased and more accurate in comparison to estimates based on samples. The model is detailed in Equation 3.

$$S(X) = P_r\left[D = \frac{1}{X}\right] = E\left[\frac{N}{X}\right];\ S(X) = F\{h\ (X_i)\} \quad (3)$$

Where:

S(x) = Represents propensity score;

Pr = Probability of cooperative membership (with cooperative, N=1 and) otherwise) dependent on X a vector of covariates observed (without cooperative characteristics); and

F{.}= Probit model with the assumption of normal and logistic cumulative distribution.

For this study, matching algorithms were used after the propensity scores were generated to match cooperative and non-cooperative members with similar propensity scores. Accordingly, three matching methods, namely the; radius (Caliper = 0.05), nearest K-neighbours (K=5) and Kernel (Bandwidth = 0.06) matching techniques were adopted to provide a reliable and robust estimate of the effect of cooperative membership. Following this, the causal effect of cooperatives on members WTP for health risk reduction from COVID-19 was calculated using the average treatment effect on the treated (ATT as specified as in Equations 4 - 5:

$$ATT = E\left(\frac{\Delta_i}{N_i} = 1\right) = E\left(\frac{G_{1i}}{N_i} = 1\right) - E\left(\frac{G_{0i}}{N_i} = 0\right) \quad (4)$$

$$ATT = E\ (\Delta_i|N_i = 1) = E\ (G_{1i}|\ N_i = 1) - E\ (G_{0i}|\ N_i = 0) \quad (5)$$

Where:

N_i = Participation in cooperative by member I and takes value: $N_i = 1$, if the respondent is a cooperative member and $N_i = 0$, if the respondent is a non-cooperative member;

G_{1i} = Outcome indicators of non-cooperative member ; and

$E\ (\Delta_i|N_i = 1)$ = Predicted treatment effect

4.0 RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Tables 1-3 details the descriptive analysis on key variables of interest covering the cooperative members, non-cooperative members and the pooled results. The results show that the mean household sizes of cooperative and non-cooperative members were 8.15 and 6.09 respectively; farm sizes were 2.10 ha and 1.16ha for both categories of respondents. Farm income stood at ₦1.10 m for cooperative members, representing three folds the ₦0.36 obtained by the non-cooperators. In addition, WTO for COVID-19 risk reduction was ₦1,268.82 and ₦211.54 respectively. On the other hand, amount paid for COVID-19 accessories per season stood at ₦3,471.54 and ₦3,508.60 for cooperative and non-cooperative members respectively. Further details on the other variables are presented in the Tables.

Table 1 : Descriptive statistics for cooperative members

Variable	Min	Max	Mean	Std. Deviation	COV
Age	17	70	36.48	9.58	0.26
Household Size	1	28	8.15	4.78	0.59
Experience	1	45	11.72	7.19	0.61
Farm Size	0.4	6	2.10	1.29	0.62
Income	165,800.00	6,630,000.00	1,100,612.65	890,217.35	0.81
WTP for COVID-19 Risk Reduction	-	5,000	1,638	1,501	0.92
Amount paid for COVID-19 Accessories	-	20,000	3,541	2,780	0.78

Source: Output of SPSS analysis, 2022

Table 2: Descriptive statistics for non-cooperative members

Variable	Min	Max	Mean	Std. Dev.	COV
Age	19.00	71.00	34.96	9.73	0.28
Household Size	1.00	25.00	6.09	4.24	0.70
Experience	2.00	41.00	9.47	6.83	0.72
Farm Size	0.00	4.00	1.16	0.71	0.61
Income	30,000	2,324,850	364,845	350,629	0.96
WTP for COVID-19 Risk Reduction	0.00	500.00	211.54	247.98	1.17
Amount paid for COVID-19 Accessories	0.00	10000.00	3471.54	2627.23	0.76

Source: Output of SPSS analysis, 2022

Table 3: Descriptive statistics cooperative and non-cooperative members

Variable	Min	Max	Mean	Std. Dev.	COV
Age	17	71	35.77	9.66	**0.27**
Household Size	1	28	7.19	4.64	**0.65**
Experience	2	45	10.72	7.06	**0.66**

Farm Size	0.2	6	1.61	1.19	**0.74**
Income	30000	6630000	757,781.99	783,672.66	**1.03**
WTP for COVID-19 Risk Reduction	0	5000	1,268.82	1,368.11	**1.08**
Amount paid for COVID-19 Accessories	0	20000	3,508.60	2,705.07	**0.77**

Source: Output of SPSS analysis, 2022

The Levene's and t-tests of equality of variance between the cooperative and non-cooperative members across the key variables of interest (Table 4), shows that the variances between considerable numbers of these variables were not equal; thus implying that there are differences between these variables for both categories of respondents. These variables are education, household size, farming experience, farm size, income, level of awareness of COVID-19 and the WTP for COVID-19 morbidity risk reduction. [14] established that COVID-19 had short and long-term socio-economic effect on the performance of cooperative societies. Meanwhile, variables with equal variances were gender of respondents, age, marital status, religion and amount spent on COVID-19 accessories. The implication of the latter results is that there are no differences between the cooperative and non-cooperative members, with respect to these variables.

Table 4: Levene's and t-test for equality of variance between cooperative and non-cooperative members

Variable	**F-test**	**Significance**	**t- test**	**Mean Difference**
Gender	5.314	0.022	1.151	0.0504
Age	0.009	0.925	1.314	1.5217
Marital Status	0.263	0.609	0.092	0.0051
Education	14.41	0.000	-3.551***	-0.5754
Religion	5.179	0.240	-1.203	-0.0493
Household Size	1.494	0.000	3.818***	2.0621
Experience	0.205	0.006	2.788***	2.3361
Farm Size	21.440	0.000	8.503***	1.0483
Income	37.511	0.000	9.296***	735,767
Level of Awareness of COVID-19	8.428	0.004	-3.022***	-0.2116
Willingness to pay for COVID-19 morbidity reduction	31.742	0.000	5.144***	791.43
Vaccination	2.216	0.138	-0.746	-0.0371
Amount spent on COVID-19 Accessories	0.203	0.653	0.213	69.401

Source: Output of spss analysis; $p < 0.5$ - significant; *** - 1 % significant

4.2 Willingness to Pay for COVID-19 Morbidity Risk Reduction and Sensitivity Analysis

Table 5 reports the WTP for COVID-19 morbidity risk reduction in the study area and the outcome of sensitivity analysis. The results indicated that cooperative members are willing to pay estimated ₦1,638, which is approximately twice the ₦846 the non-cooperative members are WTP. The value of statistical case (VSC) varied from ₦16.38m - ₦1.64b for COVID-19 risk, ranging from one in ten thousand to one in one million for the cooperative members, compared to the range of between ₦8.46m and ₦846.15m estimated for the non-cooperative members. Depending on the risk category, the implication of the results is that for cooperative membership population-average VSC of ₦16.38m for instance, the typical cooperative member is willing to pay ₦1,638 to decrease his or her chance of falling sick from COVID-19 or averting non-fatal cases of COVID-19 in a given farming season by 1 in 10,000. By extension, the result implies that one fewer person would be expected to fall sick during the farming season. Same interpretation applies to other categories of risks and the non-cooperative members. Using a criteria driven review to develop estimates for non-fatal COVID-19 cases, [16] found that the value of averting non-fatal statistical case of COVID-19 for an individual age of 40 was about $8,000 for mild cases, $18,000 for severe cases and $1.8 million for critical cases.

Table 5: Mean willingness to pay and values of statistical case (VSC)

Category of Respondents	Mean WTP (Naira)	VSC (1/10,000 risk category-Base) (Naira)	VSC (1/100,000 risk category) (Naira)	VSC (1/1000,000 risk category) (Naira)
Cooperative	1,638	16,375,839	163,758,389	1,637,583,893
Non-Cooperative	846	8,461,538	84,615,385	846,153,846
Pooled	1,269	12,688,172	126,881,720	1,268,817,204

Source: Field survey, 2022

4.3 Determinants of Cooperative and Non-Cooperative Membership and Effect of Cooperative Membership on Willingness to Pay for COVID-19 Morbidity Risk Reduction

The drivers and effect of cooperative membership on WTP for COVID-19 morbidity risk reduction was undertaken using the propensity score matching approach. The approach entailed an initial execution of the determinants of cooperative membership and non-membership proceeded by the assessment of effect of cooperative membership on WTP. Thus, Table 6 presents the determinants of cooperative membership and non-membership. The results show that education, farm size, age, household size, level of awareness of COVID-19 were strongly associated with the type of respondents' category as indicated by significance levels of 1 and 5% as application in each case, while WTP for COVID-19 morbidity risk reduction had a weak relationship. Specifically, farm size and household had a positive effect, implying that large households and farm size are likely to determine if a farmer will be a cooperative member or not. On the other hand, as farmers age, become well educated and become aware of the COVID-19, they are less likely to be cooperative members. The outcome on education is contrary to the findings of [20] who established that literate households are more likely to join cooperatives.

Table 6: Determinants of respondents' category

Variables	Coefficient	Std. Error	Z	P>|z|
Gender	0.0920495	0.2427869	0.38	0.705
Age	-0.0260796	0.0129724	-2.01	0.044
Marital Status	0.0859295	0.2218963	0.39	0.699
Education	-0.1860766	0.721913	-2.58	0.010

Religion	-0.1971949	0.253422	-0.78	0.436
Household Size	0.0573368	0.0238148	2.41	0.016
Experience	0.000674	0.0156368	0.04	0.966
Farm Size	0.6624816	0.1260751	5.25	0.000
Level of Awareness COVID-19	-0.3887459	0.1518587	-2.56	0.010
WTP for COVID-19 Morbidity Reduction	0.0001541	0.0000852	1.81	0.070
Vaccination Status	0.2835639	0.2184491	1.30	0.194
Income	0.0013097	0.0011428	1.15	0.252
Amount Spent on COVID-19 Accessories	-0.0000599	0.0000374	-1.60	0.109
Constant	0.686248	0.7690539	0.89	0.372

Source: Output of stata analysis, 2022

Table 7 shows the treatment effect estimates on effect of cooperative membership on WTP for COVID-19 morbidity risk reduction using three algorithms. The results indicated that the radius algorithm was highly significant at 1%. The implication of the result, as indicated by the ATT estimate under the radius algorithm is that, being a member of cooperative will likely increase the WTP for COVID-19 morbidity risk reduction by five hundred and sixty-one Naira, thirty-two kobo (₦561.32) relative to non-member. This result suggests that the agricultural cooperatives membership had an effect on members' WTP for COVID-19 risk reduction. Arising from this outcome, this study fails to accept the hypothesis of this study that agricultural cooperatives may not have an effect may not have an effect on rice farmers' WTP to pay for morbidity health risk reduction from COVID-19. [20] established that cooperative membership had positive and statistical significant effect on household welfare indicators. Logically, it may not be out of place to suggest that paying to reduce the incidence of COVID-19 is a way of enhancing household welfare.

Table 7: Effect of cooperative participation on WTP for COVID-19 morbidity risk reduction

Algorithms	**Cooperative**	**Non -Cooperative**	**ATT**	**Std. Error**	**t**
Nearest Neighbour	149	51	-345.638	337.943	-1.023
Radius	149	116	561.32	170.415	3.294
Kernel	149	116	-71.98	297.43	-0.242

Source: Results from Stata output

Generally, the findings of the study are likely to prompt further studies into the roles of agricultural cooperatives in other areas of public good delivery, while the health risk reduction or VSC methodology will guide future budgetary allocations within the public service.

4.4 Limitations of Study

The key limitation of the study is the difficulty in sourcing accurate willingness to pay estimates from respondents, in spite of the use of use of illustrations and local languages by the enumerators during data collection.

5.0 CONCLUSION AND RECOMMENDATIONS

The study revealed that agricultural cooperatives were willing to pay more for COVID-19 morbidity health risk reduction compared to the non-cooperative members. In addition, the VSC for cooperators was two folds that of the non-cooperators, while agricultural cooperative influenced the willingness to pay for COVID-19 morbidity risk reduction. These outcomes aptly confirm the roles of agricultural cooperative societies in public good intervention. Arising from this outcome, it becomes imperative to consider integrating cooperative society as a complementary instrument to support public good interventions, such as the prevention and control of COVID-19 pandemic. The VSC estimate further provides pecuniary basis and fiscal guidance for efficient allocation of resources for the mitigation and control of COVID-19.

COMPETING INTEREST

We declare that no competing interest exist in the making of this research work.

AUTHORS' CONTRIBUTIONS

Dr. Coker, A. A. A. designed the study, wrote the protocol and first draft of the manuscript. Yusuf, T. participated in instrument development and data collection', Dr. Oseghale, A.O. and Dr. Oladele, A.O. managed the analyses of the study. Dr. Sule, B.A. managed the literature searches. All authors have also read and approved the final manuscript.

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