

## Income, Perceived Poverty And Life Satisfaction: Matching Evidence From Nigeria

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### Abstract

This study examines the effect of income (objective or perceived) on life-satisfaction in Nigeria. Given the nature of the dataset, we estimated ordered probit regression using objective and self-reported income levels and other covariates. Although objective income is significantly positively associated with higher satisfaction, self-reported income is more robust. We further undertook counterfactual evaluation and confirm that households that are at the lowermost income level are significantly less satisfied in life. Even when compared to households just above them, these households are still less satisfied in life. However, households at the top of the income ladder do not report higher satisfaction than those just below them. The important policy implication for our work is that poverty alleviation can help lift the life satisfaction level of citizens and eradicate the social ills associated with low life satisfaction.

**Keywords :** Income; life satisfaction; Nigeria; ordered probit regression; perceived poverty; propensity score matching; subjective wellbeing.

### 1. Introduction

A number of countries in the developing world are committed to the mitigation/eradication of poverty and deprivation. It is widely recognized that poverty, as measured by low levels of income and wealth, has a wide range of negative socio-economic consequences including low

educational attainment, low productivity, lack of trust and reluctance to partake in many aspects of the society. Extreme poverty is a special case of poverty encompassing many effects of poverty in addition to inability to meet most basic needs of life such as nutrition. Extreme poverty is known to be associated with elevated incidence of crime and violence because the poor or the extremely poor are assumed to have low estimated value of life (Ryan and Deci 2001, Mahmud and Sawada 2018). Both poverty and its extreme case are often used as somewhat imperfect proxies for life satisfaction. Evaluating life satisfaction is a difficult process and as a result, most measures have focused largely on the relation between money incomes or expenditures and life satisfaction. Poverty is a public bad (Welsch and Biermann 2019) and eliminating it has a number of benefits which are likely mediated through happiness or satisfaction with life. A number of previous studies has treated low life satisfaction as an outcome of exposure to social ills such as crime, violence and poor physical environment, but in some cases such as violent behaviour, (Alcantara et al. 2017) show that low life satisfaction or wellbeing can be both cause and effect which can lead to a vicious cycle of violence. This illustrates one of the reasons why policies should promote life satisfaction and monitor the important determinants. Lessening poverty is a critical concern. However, it is not clear whether the alleviation of poverty will lift average life satisfaction. Many researchers contend that the relationship between subjective wellbeing and the traditional indicators of welfare such as income, consumption and socioeconomic status is weak (see for instance, Easterlin 1974; Appleton and Song 2008). The main argument is that people get used to their daily situations and only react temporarily to changes in status. To the extent that policies may target poverty alleviation as a means of overcoming societal illness known to be associated with low estimated life such as violence, crime and lack of trust in government, this debate is important. Knowing more accurately how income status affects self reported life satisfaction can help us know if focusing on the reduction of poverty can aid in the reduction of these social ills or if money and effort should go to other areas.

This study specifies the welfare function of Nigerians using the instrument of satisfaction with life and estimates the causal impact of income (objective or perceived) on the observed life satisfaction. Previous works by psychologists and economists shed some lights on determinants of self-perceived wellbeing (see for example, Nicola et al. 2018; Cheung and Chou 2019; Haanpää, Kuula and Hakovirta 2019 and Charles, Wu and Wu 2019). A commonly practiced method is to sample individuals' perception about their personal wellbeing on the assumption that these responses are inter-personally comparable. The inquiries by subjective wellbeing surveys have typically linked to a far-reaching notion of "happiness" or "satisfaction with life". Subjective wellbeing is currently attracting interests in policy discourse. In the developed world, a number of countries have demonstrated the importance of the concept by employing it in policy designs. The construction and inclusion of Index of Wellbeing among key policy statistics in Canada and the inclusion of the measure of "equitable and sustainable wellbeing" in the Italian State Balance in 2016 are typical examples. Furthermore, the UK, France and Germany have initiatives to include wellbeing into high level policy discussion (see Dolan and Metcalfe 2012). Developing countries are also beginning to consider wellbeing formally, with

Ecuador, Mexico and Brazil including it in their constitutions in 2008, 2010 and 2015, respectively (Nicola et al. 2018).

For many reasons, Nigeria is an exciting setting for this study. The economic and socio-political issues of the previous decade had a weighty effect on the wellbeing of Nigerian households. A significant decline in GDP associated with rising inflation and unemployment rates led to recession in early 2016. Thereafter, the country overtook India as the nation with the greatest number of extremely poor people in the world. To combat this outcome, government may intensify the implementation of anti-poverty policies. However, since poverty is better understood from its multidimensional definition, this type of study is important in two main ways: first the study will determine individual and contextual factors affecting life satisfaction among the Nigerian population. These factors may be used to target policies aimed at improving welfare within the country. Secondly, the data provides opportunity to test the controversial relationship between subjective wellbeing and other objective factors such as income and education. There have been many empirical responses to Sen (1976)'s criticisms of traditional, income-based welfare and wellbeing research. In these newer analyses of wellbeing and quality of life, most empirical works adopt a methodology that emphasizes a component approach, whereby overall wellbeing is divided into separate measurable indicators (see for example, Adams, Bell, and Tamal 2019) and associated to broadly defined measures of command over some set of resources, income and education inclusive. As already emphasized, how effectively the command over resources determine wellbeing is yet to be settled. The main objective of this study therefore, is to investigate if income (objective or perceived) has an effect on self-perceived life-satisfaction of Nigerians.

## **2. Materials and Methods**

### **2.1 Data set**

The study was designed to cover the entire 36 states of the country and at least 1000 households in each state. The first phase of the survey was conducted between September and November, 2019 in 12 states that were randomly selected from among the 36 states of the federation of Nigeria. The states surveyed include; Abia, Anambra, Imo, Bayelsa, Delta, Rivers, Bauchi, Borno, Yobe, Ogun, Oyo and Osun. To generate the dataset for this study, the study locations were separated into enumeration areas that were employed as clusters. The selection of households from these clusters was by systematic random sampling, which was achieved by randomly selecting the first respondent in the list of members of the cluster, followed by the choice of every next  $n^{\text{th}}$ . Members of eligible households who are above the age of seventeen years completed the questionnaires separately, but questions about household income and perception of poverty were asked only of household heads. Administered questionnaires covered sections ranging from socio-demographic and economic questions which generated variables such as age, gender, education, marital status, household income among others. The motivation for generating the dataset is the idea that the traditional measurement of welfare in Nigeria based on per capita GDP does not capture the true welfare situation given the high income inequality and volatility in earnings. The study observed all the ethics of field survey

and the validity and reliability tests were confirmed as appropriate. Table 1 summarises the response rate per state after eliminating units missing in key variables while Table 2 summarises the main variables generated from the data for the empirical estimations. Although religion or religiosity is potentially important in the estimation of welfare functions (Harding, Mc Conatha and Kumar 2020), we did not include it in the questionnaire because our pilot survey shows that locals are reluctant in answering questions that pertain to religion.

In addition to the objective variables generated, we also generated variable where respondents rank themselves on poverty ladder. This variable is based on the question; given your current household income, what is the situation of your household in terms of maintaining healthy living? Responses are chosen from the following options;

1. finding it very difficult to live on current income
2. finding it difficult to live on current income
3. just coping on current income
4. living comfortably on current income
5. living very comfortably on current income

In using this variable to capture subjective perception of poverty (which is self reported inability to sustain living on current income), the study makes the usual identifying guess in analysing attitudinal questions that there is inter-personal comparability of the interpretations given to the survey question. This means that we take a given step of the ladder to mean same to every individual in terms of an incessant latent measure of economic wellbeing. Nevertheless, there may still be logical differences wherein individuals rank themselves on the ladder, but these are taken as resulting only from differences in their economic wellbeing. A total of 1000 questionnaires were distributed in each state, but the response rate varies. Bauchi, Borno and Yobe states were particularly less responsive and sometimes received response does not include answers to key questions such as the life satisfaction question.

Table 1 Frequency of response to questionnaire per state

Distributed Questionnaire	State	Completed Questionnaire
1000	Abia	856
1000	Anambra	871
1000	Imo	888
1000	Bayelsa	799
1000	Delta	885
1000	Rivers	915
1000	Bauchi	675
1000	Borno	642
1000	Yobe	618
1000	Ogun	879
1000	Oyo	713

1000  
**12000**

Osun

819  
**9560**

**\*Source:** Source: Authors' computations based on data from survey 2019

Table 2 Variables description and summary statistics

Variable	Variable Description	Mean
Life satisfaction	Respondent evaluation of quality of life on Likert scale (1-10)	3.500492
Log_pc_exp	Log of household total monthly expenditure per member	9.220665
Age	Age of respondent in years	42.01352
Agesq	The square of respondent age	1954.714
HHsize	Number of household members	3.619325
Nocope	Perceived inability to sustain living on current income	.3619079
Urban	Household lives in the urban area	.6554663
Male	Gender of household head	.4913949
Married	Head is living in marriage rather than divorced or separated	.3693657
Self-emp	Head is self employed	.115309
Wage-emp	Head is in wage employment	.5143419
Student	Not working because of schooling	.083347
Unemployment	Head has no current stable employment	.1993935
Trust-govt	Respondent degree of trust in government on Likert scale (1-10)	5.107095
Env_satisfaction	Respondent satisfaction with local environmental quality (1-10)	6.444948
Abia	Respondent lives in Abia State	0.0816
Borno	Respondent lives in Borno State	0.0920
Anambra	Respondent lives in Anambra State	0.0842
Yobe	Respondent lives in Yobe State	0.1006
Imo	Respondent lives in Imo State	0.0957
Delta	Respondent lives in Delta State	0.0855
Bayelsa	Respondent lives in Bayelsa State	0.0915
Oyo	Respondent lives in Oyo State	0.1066
Osun	Respondent lives in Osun State	0.0902
Rivers	Respondent lives in Rivers State	0.0829
Ogun	Respondent lives in Ogun State	0.0832
Bauchi	Respondent lives in Bauchi State	0.0892

**\*Source:** Source: Authors' computations based on data from survey 2019

## 2.2 Econometric model

### Estimation by cross-sectional regression

We employ the ordered probit model to estimate the relationship of interest in this study. The Ordered response models are mostly used in modelling individual responses from instruments

on life satisfaction because such models recognize the indexed nature of satisfaction in life. In this application, we make the standard assumption that there is a latent but continuous descriptor of life satisfaction underlying the survey responses. Thus, the following specification was used here: Let  $y_i$  represent an observable ordered variable with values ordered from 0 to 10 depending on responses/answers to the life-satisfaction questions reviewed in the preceding section. Let  $y_i^*$  represent an unobservable variable that captures the satisfaction level of the  $i^{th}$  individual. The observed satisfaction outcome can be expressed as a function of a vector of explanatory variables ( $x_i$ ) using the following linear relationship:

$$y_i^* = x_i' \beta + u_i \quad (1)$$

Where  $u_i \sim N(0, 1)$  and  $\beta$  is a vector of unknown parameters. It is assumed that  $y_i^*$  is related to the observable ordinal variable  $y_i$  as follows;

$$y_i = 0 \text{ [ 'not at all satisfied' ] if } -\infty < y_i^* < \theta_0$$

$$y_i = 1 \text{ [ 'less than satisfied' ] if } \theta_0 \leq y_i^* < \theta_1$$

In general, the equation for estimation may be written as  $\text{prob}[y_i = j] = \Phi(\theta_j - x_i' \beta) - \Phi(\theta_{j-1} - x_i' \beta)$  for  $j = 1, 2, \dots, 10$ , where  $\Phi(\cdot)$  represents the cumulative distribution function connotation for the standard normal. In order to identify the parameters, the estimation constant or one of the fixed threshold parameters has to be excluded from the estimation.

### Treatment effect estimation

The relationship between life satisfaction and measures of income is an interesting finding for theoretical and practical reasons. However, given the cross-sectional nature of the estimation data, coefficients obtained by the cross-sectional regressions may not be given causal interpretation. The study then employs the propensity score matching (PSM) as proposed by Rosenbaum and Rubin (1983) to investigate the treatment effect of the various classes of being income-poor on subjective wellbeing (see Clément 2011). In this section, we describe the PSM estimation procedure. This method is applicable because we are able to delineate the sample into treatment and control groups based on the poverty indicator. The treatment and control groups are captured by a qualitative or dummy variable  $D_j$  which is represented by 1 if household  $j$  belongs to the given poverty class and zero otherwise. Let  $Y_{j1}$  and  $Y_{j0}$  denote the outcome variables that reflect the wellbeing for household  $j$  when there is treatment and when there is no treatment, respectively. The treatment effect is therefore calculated as the variance in the outcome variable between the treatment and control group. The problem however is that the same unit in the 2 different states is not observable: we can estimate  $E(Y_{j1}/D_j=1)$  and  $E(Y_{j0}/D_j=0)$  but not their counterfactuals  $E(Y_{j1}/D_j=0)$  and  $E(Y_{j0}/D_j=1)$ . PSM presents a solution to the probable bias that comes as a result of the unobservability of the counterfactual outcomes. The process includes the development of an index often referred to as the 'propensity score' (PS) which recapitulates the pre-treatment features of each theme and creates the possibility to match observations from treatment and control groups.

The propensity score, represented as  $P(X) = P(D_j=1/X)$ , shows the likelihood of obtaining the treatment conditional upon observed covariates. Matching treatment and control groups and

paying attention to observables invariably ignores the unobservables (Dehejia and Wahba 2002). The PSM model posits that given a set of observable variables  $X$ , the outcome of interest in this case life satisfaction, is independent of the treatment participation. This condition is referred to as the conditional independence assumption and suggests the non-appearance of selection bias due to unobservable variables. This condition in addition to the common support assumption ensures that the treatment assignment is random. Practically, the reasons why matched pair of respondents falls on different sides of poverty are assumed to depend on unobserved factors. The empirical analysis in this study is built on the supplementary supposition that these unobserved factors are randomly distributed in the population.

Given treatment participation, we estimate the propensity scores conditioning on the covariates. Then, taking advantage of efficient matching estimators, we ensure that the treated and control samples are sufficiently similar. The following estimators are used in the study; the nearest neighbour estimator, which obtains the average treatment effect on the treated (ATT) by averaging the differences in the outcome over, treated and control groups with the closest propensity scores. The radius calliper estimator consists in matching each treated unit with those control units whose PS falls into a neighbourhood of the PS of the treated group. According to Dehejia and Wahba (2002), the caliper defines the dimension of the neighbours. Thus, we employ the caliper at 0.05 following Clément (2011). Finally, the kernel method which is based on gaussian kernel distribution is also employed. The use of the different matching strategies is to ensure robustness of the ATT given the different distribution assumption of the matching estimators. The PSM therefore analyses the average effect of poverty on the observed life satisfaction.

### **3 Empirical results and Discussion**

#### **Results from ordered probit estimation**

The maximum likelihood estimates from the ordered probit regressions for the life satisfaction equation specified in (1) are presented on the first and second columns of Table 3. *Ceteris paribus*, the assessed coefficients provide the average outcome of a characteristic on the standardised probit index. The sign on the assessed coefficients shows the direction of the effect of an individual's life-satisfaction as computed by the latent dependent variable. The findings of the study agree with previous empirical evidence on the subject. Per capita household income significantly pushes up measured life satisfaction with an elasticity of about 0.03%. The OLS estimations suggest that the elasticity of wellbeing with respect to per capita income is 0.06%. Given that the average income in the sample is about fifteen thousand naira per month, a one percent increase in life satisfaction costs about nine hundred naira per month on average and *ceteris paribus*. This finding suggests that income contributes to household wellbeing. However, its impact is much smaller than the effect of perceived poverty (*nocope*). Based on the ordered probit results, given income, Nigerians who find it difficult to cope with their current income are 150% less likely to be classified as most satisfied with life than those who merely cope on their current income. This large effect may not necessarily be causal.

Table 3 Ordered probit regression estimates

	(1) Coefficient	(2) Coefficient	(3) Coefficient	(4) Coefficient
Log per capita exp.	0.312***	0.314***	0.600***	0.608***
Age	0.027***	0.030***	0.056***	0.060***
Age Squared	0.000***	0.000***	-0.001***	-0.001***
Household Size	0.028***	0.028***	0.112***	0.113***
Nocope	-1.514***	-1.505***	-2.768***	-2.741***
Urban	0.128***	0.129***	0.205***	0.203***
Male	0.099***	0.095***	0.248***	0.244***
Married	0.021	0.020	0.090*	0.088*
Unemployed	-1.193***	-1.205***	-1.687***	-1.689***
Self employed	0.184***	0.171***	0.438***	0.422***
Wage employed	0.078**	0.060*	0.198**	0.170**
Years of schooling	0.445	0.397	0.786	0.803
Nocope * Schooling	0.391***	0.390***	0.797***	0.794***
Unemployed * schooling	0.322***	0.323***	0.545***	0.542***
Trust in government Satisfaction with the env.	0.003		0.008	
	0.014**		0.019	
Regional effects (Ogun and Rivers dropped)				
Abia	-0.065	-0.042	-0.045	0.004
Borno	0.425***	0.462***	1.568***	1.651***
Anambra	-0.033	-0.011	-0.035	0.005
Yobe	0.151***	0.195***	0.753***	0.848***
Imo	0.457***	0.474***	1.007***	1.040***
Delta	0.137***	0.173***	0.414***	0.482***
Bayelsa	0.407***	0.419***	0.960***	0.985***
Oyo	0.238***	0.262***	0.653***	0.708***
Osun	-0.292***	-0.280***	-0.494***	-0.461***
Bauchi	-0.262***	-0.250***	-0.405***	-0.380***
$\theta_1$	-0.103	-0.126	-4.380***	-4.423***
$\theta_2$	0.197	0.173		
$\theta_3$	0.740	0.712		
$\theta_4$	1.179	1.147		
$\theta_5$	1.869	1.836		
$\theta_6$	2.308	2.274		
$\theta_7$	2.676	2.641		
$\theta_8$	2.898	2.863		
$\theta_9$	3.085	3.050		



$\theta_{10}$	3.870	3.833		
Pseudo/R-squared	0.153	0.154	0.456	0.459

\***Source:** Authors' estimations based on data from survey 2019

If we broadly divide the households into those finding it difficult to cope with their income and those who are not, inability to cope with income depresses life satisfaction and the difference in life satisfaction between the two groups is 1.5 based on the ordered probit estimation and 2.7 based on the OLS estimation. Age has a non-linear impact on life satisfaction, rising first and falling at the stationary point of 45 years. Being unemployed in Nigeria or being extremely poor in the sense of not being able to maintain living with current income decreases life satisfaction, and this result is also evident in other empirical works (Alesina, Tella & MacCulloch 2004; Eggers, Gaddy & Graham 2006; Sanfey and Teksoz 2007; Hayo 2007; Winkelmann and Winkelmann 1998). However, schooling on its own doesn't have perceptible effect on life satisfaction, but the impact of schooling is mediated through unemployment and poverty. The interaction terms of schooling with unemployment and poverty are positive and significant. This suggests that the utility of education is only realised through overcoming unemployment and deprivation. The choice of estimator (ordered probit {columns 1 and 2} or OLS {columns 3 and 4}) does not alter these inferences. In particular, all the estimated coefficients maintain the same sign and level of significance in both estimations, with only slight changes in magnitude. This concurs with the postulation that with large number of ordered categories, ordered outcome regression converges to ordinary least square regression (Ferrer-i-Carbonell and Frijters 2004). In what follows, we exploit this property to analyse the causal influence of poverty status on life satisfaction using PSM algorithm.

The large slopes of per capita expenditure and perceived poverty dummy suggest the central role of income in this developing country in the determination of life satisfaction. This means that the various interventions for poverty eradication implemented in the country are desired but are yet to achieve the optimum results. However, not much inference can be made from this observation being that the estimation is based on cross sectional data. Such data are given to selection bias whereby other unobserved features connected with a certain household somewhat than their economic level can possibly have an effect on their satisfaction in life. This implies that the ordinary least square results could be biased. In the absence of an appropriate instrument in the dataset to rectify the bias, we employ PSM analysis to estimate the effect of perceived poverty on life satisfaction. Five matching strategies are employed to ascertain the causal effect of perceived poverty on life satisfaction. The fundamental inkling of the propensity score matching is to evaluate the average treatment effect associated to the perception of poverty on life satisfaction. Specifically, the study compares the average life satisfaction of households who are categorised as poor and the non-poor, matching the two sets of households by features that look alike. The alteration in life satisfaction could then be ascribed to their poverty status.

### **Results from propensity score matching (PSM) estimation**

The reported satisfaction in life by the household head reflects family utility from the consumption of various goods and services and household characteristics are very imperative to recognize how income is assigned by the households. Differences in reported life satisfaction could therefore represent the efficiency with which resources are allocated and/or the size of the income available for distribution. Given propensity score matching where the propensity score is computed using detailed household characteristics, accounts can be given for allocative efficiency and causal impact of poverty on life satisfaction may be estimated. The summary statistics of the study are presented in Table 4 which include household configuration variables and household head features which are employed to estimate the propensity scores. The propensity scores are computed for the three categories of households: those who find it problematic to live on their current income, just surviving on current income and those living contentedly on current income. The assessment of the propensity scores shows the outcome of each covariate on the probability of being in the given category and based on the fact that the explained variable is a binary outcome, the logit model is used to compute the propensity scores. Table 4 displays the logistic regressions for the 3 mutually exclusive income level indicators. The results show that the signs of majority of the explanatory variables follow a priori expectations.

Table 4 Estimates of the selection model

Variable	(P1) Marginal Effect	(P2) Marginal Effect	(P3) Marginal Effect
Age	0.025***	0.016***	-0.012***
Age squared	0.0003***	0.0002***	0.0001***
Log per capita Exp.	-0.337***	-0.308***	0.224***
Self employed	0.011	0.011	-0.010
Wage employed	0.019	0.051***	-0.032***
Unemployed	0.098***	0.054**	-0.049***
Household size	-0.065***	-0.064***	0.045***
Urban	-0.005	0.008	-0.002
Male	-0.019*	0.017	-0.006
Schooling	-0.007***	-0.003*	0.003**
Married	0.127***	0.080***	-0.068***
State			
Abia	-0.071***	-0.116***	0.062***
Borno	-0.372***	-0.445***	0.396***
Anambra	-0.021	-0.015	0.015
Yobe	-0.140***	-0.174***	0.116***
Imo	-0.137***	0.072***	-0.018**
Delta	-0.283***	0.033	0.018
Bayelsa	-0.238***	-0.162***	0.130***

Oyo	-0.199***	-0.114***	0.095***
Osun	-0.076***	-0.141***	0.083***
Bauchi	0.068***	0.021	-0.006
Observations	10,327	6,550	10,327
Pseudo R2	0.1442	0.1341	0.1881

**\*Source:** Authors' estimations based on data from survey 2019

The probability that a household finds it difficult to live on current income (P1) rises with the age of the household head, decreases with per capita income as expected and this incidence is more among the unemployed household heads and less among male headed households. Compared to households where the head is divorced or never married, households in subsisting marriage are more likely to be in this category. Number of years of schooling reduces the chance of falling into this category, an observation that is not surprising given the role of human capital in earnings. The households finding it tough to live on current income (FDC) are not very different from those just coping on current income (JC). The only remarkable difference is that while male headed households are more likely to fall into the category of finding it difficult to live on current income, the gender of the household head does not matter for just coping with current income. The implication of this is that female headed households make up majority of the extremely poor people in Nigeria. When we model households living comfortably on their current income (LCI), we find a somewhat opposite result when compared to the previous two probabilities. Remarkably, number of years of schooling is significantly and positively associated with belonging to this category and mainly households not living in marriage are found here. While the impact of schooling is expected, the role of marital status in this category is a bit controversial given that household size is positive and significant. How the fact of being in marriage reduces the chance of living comfortably on current income deserves more investigation.

Overall, the treatment effect is robust across the various matching estimators and for the various expenditure types. The preferred estimator is the kernel estimator, which scores highest in terms of bias decline in each treatment situation. For every single exogenous variable, Table 5 shows the bias prior to and after the matching and the realized percentage reduction in bias using the kernel estimator. With few exemptions, the percentage of bias decrease for each variable after the matching is between 50% and 90%. The lone variable wherein the variance between the 2 groups is not eradicated is the indicator for household head with secondary education when the treatment is just coping with current income. Nevertheless, the bias is trivial prior to matching and this variable does not have any impact on the probability of getting the treatment. Finally, the t-test illustrates that for each variable there is no significant difference in the mean after the matching.

Table 5 Balancing tests for the propensity score matching – Gaussian Kernel estimator

Variable	Sample	% bias	% bias reduction	t-test
Size	Unmatched	22.8		3.54***
	matched	-0.8	96.3	-0.10
Age of head	Unmatched	20.3		3.54***
	matched	-0.1	99.8	3.18***
Age squared	Unmatched	28.1		4.31***
	matched	2.0	92.9	0.26
Log per capita Exp.	Unmatched	45.4		7.51***
	matched	4.3	90.7	-0.49
Self-employed	Unmatched	15.2		2.35***
	matched	2.7	82.9	0.35
Wage employed	Unmatched	32.7		5.12***
	matched	6.4	80.4	0.81
Unemployed	Unmatched	-24.6		-3.91***
	matched	-4.8	86.1	-0.71
Schooling	Unmatched	12.8		3.44***
	matched	-0.11	76.3	-0.15
Married	Unmatched	11.8		4.23***
	matched	-0.8	96.3	-0.10
Urban	Unmatched	24.8		9.57***
	matched	1.8	90.3	0.18

\*, \*\*, \*\*\* significant at 10%, 5% and 1%, respectively

\*Source: Authors' estimations based on data from survey 2019

The findings of the average treatment effect on the treated (ATT) given the different matching strategies are shown on Table 6. When the t value is employed to investigate the significant level of receiving the treatment on the reported life satisfaction, the study reveals that when the treated is recognised as being poor to the extent of finding it either difficult or very difficult to live on current income, then there is a reduction in life satisfaction. However, there is no statistical difference in life satisfaction between those just coping on current income and those living comfortably on current income.

Table 6 Propensity score estimates

Treatment	Nearest Neighbour		Five-Nearest Neighbour		Ten-Nearest Neighbour		Kernel		Radius Caliper (0.05)	
	ATT	t	ATT	T	ATT	T	ATT	t	ATT	T
FDC	-0.016 (0.01)	-1.59	-0.018 (0.01)	-1.83*	-0.018 (0.00)	-1.85*	-0.020 (0.00)	- 2.11*	-0.021 (0.00)	- 2.15*
JC	0.019	1.16	0.010	0.72	0.015	1.06	0.015	1.15	0.016	1.18

	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)	
LCI	0.004	0.92	0.005	1.08	0.004	0.85	0.006	1.33	0.006	1.30
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	

\*, \*\* significant at 10% and 5% respectively

Treatment = income indicators: FDC-finding it difficult to cope, JC-just coping and LCI-living comfortably with income

\***Source:** Authors' estimations based on data from survey 2019

The results in Table 6 show that households not coping with their current income have significantly depressed life satisfaction which is what is expected. However, this effect does not transmit linearly over the income space; the households just coping with their income are no more or less satisfied than the households living comfortably on family income. The findings are consistent when we compare the five matching strategies. The findings suggest that there exists a positive sign that poverty alleviation may eradicate the worst case of life satisfaction and the associated social ills.

#### 4 Conclusion

This novel study in the context of Nigeria is timely as the federal government has identified poverty and deprivation as one of the main factors responsible for violent conflicts in the country. Because the approach of measuring welfare in terms of monetary income followed by the government has been shown as inadequate measure of utility, this study presents alternative approach which previous studies recommend as more appropriate in the context. It is clear from our data that objective income deviates from self reported life satisfaction. For instance, in our preliminary regressions, self-reported poverty level robustly predicts life satisfaction but in a reduced form regression, log of household income per capita does not predict the self-reported poverty given usual controls. The study tests economic theories with respect to life satisfaction, particularly the role of income. In terms of estimation procedures, we treat life satisfaction as both cardinal and ordinal variable estimated with ordinary least squares (OLS) and ordered probit regressions respectively.<sup>1</sup> In the end, we undertook counterfactual estimation in which the various levels of self-reported poverty are used in turns as treatments. The counterfactual evaluations clearly show that at the level of extreme poverty, income predicts life satisfaction which supports the use of poverty alleviation to enhance perception of life subject to thresholds.

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#### Acknowledgements

<sup>1</sup>Ferrer-i-Carbonell and Frijters (2004) suggests that both treatments yield similar results when the number of ordered categories is large as it is in this case

The authors would like to thank the Editor-in-Chief and anonymous reviewers for their time and suggestions which were most helpful in improving this article.

### **Conflicting Interests**

The authors declare that they have no potential conflicting interests with respect to the research, authorship, and/or publication of this manuscript.

### **Funding Information**

The authors received no financial support for the research, authorship, and/or publication of this manuscript.

### **Disclaimer**

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