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## **Gender Difference in Nutrition and Health in Agricultural Households in Nigeria: the Role of Corporate Social Responsibility in Oil Producing Communities**

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**Gender Difference in Nutrition and Health in Agricultural Households in Nigeria: the Role of Corporate Social Responsibility in Oil Producing Communities****Joseph I. Uduji & Elda N. Okolo-Obasi****Abstract**

The purpose of this paper is to critically examine the multinational oil companies' (MOCs) corporate social responsibility (CSR) initiatives in Nigeria. Its special focus is to investigate the impact of the global memorandum of understanding (GMOU) on gender difference in nutrition and health in the Niger Delta region of Nigeria. This paper adopts a survey research technique, aimed at gathering information from a representative sample of the population, as it is essentially cross-sectional, describing and interpreting the current situation. A total of 800 women respondents were sampled across the rural areas of the Niger Delta region. The results from the use of a combined propensity score matching and logit model indicate that CSR of the MOCs using GMOU model has made significant success in closing the gender difference in nutrition and health in agricultural household in the Niger Delta region. The findings also show that mainstreaming gender in nutrition within the field of agriculture is a critical aspect of strengthening gender and nutrition/health linkages, in recognition of women substantial contribution to agriculture production and their central role in household food collection, preservation/processing and preparation. This suggest that mainstreaming gender in nutrition offers opportunities to integrate agriculture and health approaches in GMOU projects, which will require increased collaboration and coordination between the MOCs' and CBD clusters in the field of gender and nutrition to exploit existing complementary and comparative advantages, and to apply a holistic approach in host communities. This implies that gender and nutrition/health have multiple dimensions and are highly context-specific; and the pathway towards improved food and nutrition security for all should be a gender-equitable process incorporated in CSR programmes and projects in sub-Saharan Africa. This research contributes to the gender debate in agriculture from a CSR perspective in developing countries and rationale for demands for social project by host communities. It concludes that business has an obligation to help in solving problems of public concern.

**Keywords** Gender, nutrition and health, agricultural households, corporate social responsibility, multinational oil companies, sub-Saharan Africa

**Paper type** Research paper

## 1. Introduction

Gender inequalities in earnings, ability to access health and educational accomplishment are prevalent across the continent of Africa. Women normally have restricted access to land, learning (education), credit, technology, information, and decision-making forums. This causes direct harm to women as well as their children, and worsens African economies (African Development Report, 2015). Women have the primary obligation of child raising and depend on developed social networks that function as an informal safety net for the household (family) in times of emergency. When they are a part of formal employment, they normally take lower remuneration rates than their male co-workers, even when they have acquired and utilize similar skills (Oniang'o and Mukudi, 2002). Because of their three-layered burden of industrious, procreative, and social role, women lean towards not having time to cater for their own needs, whether relaxation related or otherwise; also, because of their recurring loss of iron and reproduction, their nutrition status is usually susceptible to deficiencies in nutrition, care, and health or hygiene (Chih-Ping, 2017). Besides, the nourishment (nutrition) status of newborns and infants is closely linked with the nourishment status of the mother before, during, and after pregnancy (ACC/SCN, 1997). Poor female nourishment early in life weakens learning potential, increase procreative and maternal health risks, and reduces productivity. This situation adds to women's weakened capacity to gain access to other resources later in life and undercuts efforts to abolish gender disparities; and in essence, women whose nutrition status are poor end up being caught in a vicious circle of impoverishment and malnourishment (FAO/ILSI, 1997). Variations in the ability to access and have control of resources have severe consequences for women's capacity to make available food, upkeep, and health cum sanitation services to their children, their husbands, and even themselves, but particularly their female children (ACC/SCN, 1999). Women with less power to influence things within families (households) and community will be incapable of assuring fair food circulation within the family/household (ICN, 1992). They will also lack the capacity to visit health clinics when their infants and children are in bad states health-wise and will lack the time for relating with their infants and other children (World Bank, 2001).

For the time being, Nigeria remains the largest oil and gas producer in Africa. The Niger Delta where multinational oil companies (MOCs) retain a notable presence has become a region of ceaseless protest and violent conflicts. The federal government of Nigeria (FGN) is in joint-venture agreements with the MOCs functioning in the oil and gas sector of the nation. The FGN controls and possesses the land as well as its natural resources in the subsoil. This is a key

basis of conflict in the Niger Delta; and lands can be obtained by the FGN for use in any way they deem fit (over-riding public purposes) by virtue of the Land Use Act 1978. The negative effects of the undertakings of the MOCs in the region include oil spillage, gas flaring, environmental pollution, conflict, negative social impact, violence amongst others (Ekhatior, 2014). Nevertheless, MOCs partake in a plethora of corporate social responsibility in the Niger Delta and even other parts of Nigeria. Every year, MOCs invest in social projects and programmes in communities mostly in the Niger Delta. As the years pass by, OCs have enhanced on how they carry out their action with local communities to convey these projects (Frynas, 2009). In 2006, they brought into functioning a new way of operating with communities called the Global Memorandum of Understanding (GMOU). The GMOU represent an essential shift in CSR method of MOCs in the region, putting more emphasis on openness and responsible(accountable) processes, consistent communication with the grassroots, sustainability and conflict avoidance (SPDC, 2013). A GMOU is statement written down between MOCs and a group (or cluster) of several communities in line with local government or clan/historical similarity as advised by the appropriate state government. Under the terms of agreement with the GMOUs, communities select the development they want, while MOCs deliver secure funding for five years, making sure that the cluster development boards (CDBs) have steady and dependable funding as they carry out the execution of their community development plan (Chevron, 2014). When 2012 came to an end, MOCs have been able to sign agreement with 33 GMOU clusters which covered 349 communities, almost 35% of the local communities all over the business set-ups in the Niger Delta (SPDC, 2018).

Thus far, the extent to which the CSR initiatives of MOCs have assisted in community development in the region remain questioned (Asgil, 2012; Edoho, 2008; Marchant, 2014; Idemudia, 2014; Aaron, 2012; Slack, 2012). For example, Akpan (2006) has contended that the CSR initiatives of MOCs have failed to add to community development and in some instances have resulted in inter and intra-community conflicts. In contrast, Ite (2007) proposed that the CSR initiatives of the MOCs have actually backed community development in the region given the extent to which the government has failed. According to him, MOCs have continually made better their CSR strategies so as to react to the needs of their host communities in a much improved way. Lompo and Trani (2013) added some nuance to the debate as they advocated that the CSR initiatives of MOCs have added to access to such essential amenities like water, electricity and shelter, but have also weakened human development. Similarly, Renouard and Lado (2012) put it on record that the CSR activities of

MOCs have somewhat added to the enhancement of the material welfare of some of the people living close to oil production sites, but dissimilarities among genders have actually worsened in these communities. Subsequent to the preceding deferring points of view of the MOCs' GMoU model in the Niger Delta, this paper adds to gender discourse in healthcare and comprehensive growth literature from the CSR perspective, by examining empirical facts in four areas that have enjoyed much attention in the literature. The paper seeks ascertaining the level of CSR venture (investment) that the MOCs have made in the area of nutrition and health, as well as finding out the level of assistance from such investment that accumulate for the rural women and its effect on their productivity in agriculture and revenue-yielding activities. These four areas of focus likewise stand for four main questions, notably:

- i. How serious is MOCs' CSR investment in providing nutrition and health in the Niger Delta region of Nigeria?
- ii. To what extent are the genders represented in the GMoU intervention of the MOCs in the host communities?
- iii. Do MOCs's GMoU interventions initiate public policy on women's status by improved attention to nutrition and health in the Niger Delta region of Nigeria?
- iv. Do MOCs' GMoU investment in nutrition and health positively influence human capital for the productivity of women in agriculture in the Niger Delta region of Nigeria?

### **1.1 Study hypothesis**

Women of the Niger-Delta region of Nigeria are very economically active, but their input to the economy is being held back by various limitations. For instance, women are still victims of gender gaps in academic pursuit, although there has been much evolvment. The region's overall improvement in access to health-care services has not translated into a corresponding progress in the nutrition and health status of women and girls. PIND (2011) report puts forward that mortality in the region is still a key issue, along with social obstacles, such as women's time distribution and traditional roles. As a result, we hypothesize as follows:

- CSR of MOCs using GMoU has not been able to substantively impact on rural women's nutrition and health in the Niger Delta region of Nigeria.
- Nutrition and health status of rural women do not really impact on the productivity of women in agriculture in the Niger Delta region of Nigeria.

In line with the aforementioned, the main aim of this research is to ascertain the level of CSR investments of MOCs in nutrition and health, and in what ways such intervention results in rural women bettering their productivity in agriculture and revenue-breeding activities in host communities. The paper adds to the inequality debate in nourishment and health, and inclusive growth literature from the standpoint of CSR. The study makes use of a quantitative approach and applied survey research technique. The direction of this research departs from current gender and nutrition literature, which has targeted on inter alia: women, health and progress (WHO, 1985); repositioning nutrition as central to development (World Bank, 2006); gender and nutrition (FAO, 2012); gender equality in agriculture (Adamon and Adeleke, 2016); health, nutrition and prosperity (Thomas and Frankenberg, 2002); gender equality and women's empowerment (IFAD, 2012); enabling and equipping women to improve nutrition (Mucha, 2012); gender discrimination in land ownership (Ajala, 2017); quality of life, coping strategies, and psychological distress in women with primary and secondary infertility; a mediating model (Saif, Rohail and Aqeel (2021); marital conflict, self-silencing, dissociation, and depression in married madrassa and non-madrassa women: a multilevel mediating model (Naeem, Aqeel and de Almeida, 2021); the moderating role of emotional intelligence between inter-parental conflicts and loneliness in male and female adolescents (Hafsa, Aqeel and Shuja, 2021); the prevalence of psychiatric disorders in breast cancer patients; a cross-sectional study of breast cancer patients experience in Pakistan. (Rashid, Aqeel, Malik and Salim, 2021); and coping strategies, pain severity, pain anxiety, and depression, positive and negative affect in osteoarthritis patients: a mediating and moderating model (Sarfraz, Aqeel, Lactao and Khan, 2021).

Accordingly, the other aspects of the paper are presented in the following order: section 2 (a brief examination of literature and theoretical underpinnings); section 3 (description of method and materials); section 4 (the results and corresponding discussion); Section 5 (conclusion with implications and future research directions).

## **2. Literature and theoretical underpinnings**

### **2.1 Background**

The oil sector makes available 80% of the Nigerian government's income, but its performance is not effective, and its input to the economy is not equitable (Africa Competitiveness Report, 2017). According to African Economic Outlook (2017), between 2013 and 2015, \$3.9bn (₦858bn) was lost to the vandalizing of pipeline and theft of grand crude oil. Nigeria carries on

to spend huge amounts of scarce foreign exchange bringing in refined petroleum, as domestic capacity is inadequate to meet demand. Accusations in the air is that the government resources allotted for refineries upkeep are averted by the political elites (Francis *et al*, 2011). Embezzlement of resources is also obvious in the case of the oil-rich Niger Delta region; despite the distribution of significant resources (funds) from both the public and private sources for the region's improvement since 1999, the local communities still live in terrible conditions, including gas flaring, environmental pollution and degradation, acid rain, low level of development of humans, and lack of infrastructure (UNDP, 2006). The knowledge (experience) of both men and women in the region remain shaped by firm gender ideologies that define suitable male and female behaviour; what men and women are permitted to do, how they are anticipated to behave, what jobs they can get involved in and how they interrelate within the larger community are prearranged by traditional gender norms (NDDC, 2001). Many of these gender norms have negative health and social consequences and severely limit the ability of women to meaningfully partake in and gain from the improvement efforts and MOCs' interventions (PIND, 2011). The gender norms differ among and within diverse ethnic groups in the region. Traditionally, in families where food is rare, food taboos exist to inhibit women from eating necessary food items, such as meat, fish and eggs, mostly during pregnancy and lactation. As a result, malnourishment including anaemia among women becomes a serious health issue, particularly among those who have too many pregnancies that are not well spaced (NDDC, 2004).

## **2.2 State-sanctioned discriminatory practices**

In Nigeria, there are challenges women face in the agricultural household. The key constraints affecting women's inability to improve nutrition, healthcare and efficiency in agriculture include the followings. Firstly, in Nigeria, women farmers receive less than 10% of the credit offered to small-scale farmers; women farmers are deterred from applying for formal loans because of the complexity of the administrative processes, unsuitable loan sizes and credit rates; typically, women are not found in farmer clusters; in 2007, some 20, 098 men accessed loans compared to 8, 550 women (Adamon and Adeleke, 2016). Secondly, women participation in farmer training is slow due to the lack of awareness society barriers, and transportation facilities; cultural norms restrict women from accessing ICT (Francis *et al*, 2021; Okongwu, 2020). Thirdly, due to poor financing, women are unable to access agricultural inputs such as improved seedlings and fertilizer; women farmers have indicated that they are unable to use inputs due to high cost in the open market (PIND, 2011; Olusegun and Oyelade, 2021).

Fourthly, women in Nigeria generally and Niger Delta in particular own less land due to traditional authority; in 2012, women own 4% of the land in the North-East, and just over 10% in the South-East and South-South, less than 10% of Nigerian women own land; thus, the lack of land ownership significantly reduces the chances for women's access to financing because of the need for collateral (Ajala, 2017). Furthermore, women bear the brunt of environmental injustice in Nigeria and the consequences of the operations of MOCs which have also impacted negatively on the health of women in the Niger Delta (Ekhator, 2020). Hence, the impact of MOCs' operation in Niger Delta have considerably weakened women's access to pollution-free farm lands and fishing waters. The consequences of the increased frequency in floods and draughts are far reaching, particularly for vulnerable groups, including women who are responsible for water management at the household level. Notwithstanding, that women in Nigeria face state-sanctioned discriminatory practices, and economic and social barriers, they have stood up against the negative activities of MOCs by protesting those activities and eventually pushing the MOCs to concede to some of the women's demand in the Niger Delta (Ekhator, 2019).

### **2.3 Theoretical underpinning**

There is a strong dispute among scholars that CSR in developing countries is mainly shaped by the socio-economic environment in which their firms run and the enlargement priorities this creates. For example, Muthuri (2012), relying on the extant literature on CSR in Africa, postulated that the CSR issues dominant in Africa include impoverishment reduction, community development, acquisition of knowledge and training, economic and enterprise development, corruption, health and HIV/AIDS, environment, sports, human rights, as well as governance and accountability. Amaeshi *et al* (2006) argue that CSR in Nigeria is precisely targeted at addressing the socio-economic development problems of the country, including alleviation of impoverishment, health-care provision, infrastructure improvement, and education. This, they argue, contradicts many Western CSR priorities, such as climate change concerns, or socially responsible investments, consumer protection, fair trade, and green marketing. Similarly, Schmidheiny (2006) questions the suitability of imported CSR approaches, citing examples from Latin America, where the most issues like penury and tax evasion are typically not included in the CSR conceptions, methodologies, and tools originating in advanced countries. By contrast, locally developed CSR methods are more likely to react to the many social and environmental problems in the region, such as deforestation, joblessness, revenue inequality, and crime (De Oliveira, 2006). Middleton (2005) claims that having CSR



guided by the socio-economic priorities of a nation or region is simply good business; he further suggests that companies in emerging countries have to vigorously shape the socio-economic and political landscape in order to make available an operating environment which is beneficial to business. According to Brennan and Baines (2006), the business reaction to the socio-economic problem of HIV/AIDS is a case in point. Visser (2006) used the survey of CSR in Africa to challenge the correctness and applicability of Carroll's (1991) CSR pyramid and maintains that if Carroll's basic four-part model is accepted, it is proposed that the relative priorities of CSR in Africa are likely to vary from the classic, American ordering. It also suggested that Carroll's CSR pyramid, which is perhaps the most well-known model of CSR, may not actually be the best model to grasp CSR in general, and particularly CSR in Africa. Hence, this study adopts quantitative methodology but views the result from the African CSR standpoint, as it relates to the liberal feminist theory, which postulates that if women enjoy equal access to available opportunities like men such as academic, work experience, nourishment and health, and others, they would behave in the same way (Unger and Crawford, 1992; Fischer *et al*, 1993). Proof generated from the study would show MOCs how CSR making effective use of GMoU programmes can be patterned in ways that effectually and impartially advance the social, health, and nutritional status of both men and women in the Niger Delta region of Nigeria.

### **3. Method and materials**

Firstly, the paper is a response to the urgent need for further research on CSR in Niger Delta, as well as on theoretical constructs. Secondly, it is also a bridge to the dearth of international research which surveys the nature and extent of CSR in developing countries, as compared with developed countries. Thirdly, research into CSR in the Niger Delta is still relatively underdeveloped and tends to the adhoc with a heavy reliance on convenience-based case studies or descriptive accounts. Hence, the effort (work) takes on a quantitative methodology, as an addition given the shortage of quantitative works in the region (Lompo and Trani, 2013). The survey research technique was put to use with a view to bringing together cross-sectional information from an illustrative sample of the population. It is largely cross-sectional which defines and interprets the condition of the present time in the region. Figure 1 reveals the component administrative States of Nigeria's Niger Delta region.



**Figure 1:** Constituent administrative states of the Niger Delta, Nigeria  
**Source:** NDDC, 2004

### 3.1 Sample size

Using the Fisher (1998) formula, we computed the sample size used in the study.

Mathematically, the formula is represented thus:

$$n = \frac{z^2 p(1-p)}{d^2}$$

As it works,  $n$ = the sample size; while  $z$  = the standard normal deviation for a given level of sureness, (95% confidence =1.96),  $d$  = margin of error at 0.05 for CI at 95%;  $p$ = proportion women in the population to be assessed. In this study, we presumed  $p$  to be 0.51 as the population of women in the evaluated population is about 51%. The calculated sample size is stated thus:

$$n = \frac{1.96^2(0.51)(1-0.51)}{0.05^2} = n = \frac{0.969708}{0.0025} = 388; \text{ approximated to } 400.$$

However because we work with both treatment and control population, we multiplied this by 2 to further lessen any possible errors in the sample chosen. That is the reason for the total sample size used being 800 respondents.

### 3.2 Sampling procedure

Multi-staged sampling method was used in this study to pick the final respondents. We were careful in selecting samples from communities with reasonable presence of MOCs or MOCs' facilities. This is in addition to choosing communities that have joined a cluster development board (CDBs) and those who have not. The communities that have joined cluster development board we referred to as CDB communities while those that have not we called non-CDB communities. For this reason, we purposively chose 2 local government areas (LGA) from each of the 9 states of the region on the ground that MOCs upheld a highly significant presence in the LGAs. In stage two, we picked 2 host communities (1 CDB and 1 non CDB) from each of the selected LGAs, on same ground of strength of MOC presence. Of the two communities picked, we called the non- CDB communities *control group*, and the CDB communities *treatment group*. In the last stage, with the aid of the community gate keepers, we casually selected 400 respondents from the *treatment group* and 400 from the *control group* to be in line with the 800 respondents used in the study. We then distributed the sample according to the evaluated population of women in each of the picked states as follows:

**Table 1.** Sample size distribution table

States	Population	Population of women	% of Total Population	Sample Per Sate	CDB Women	Non-CDB Women
Bayelsa	2,277,961	1,161,760	6%	48	24	24
Abia	3,727,347	1,900,947	9%	72	36	36
Cross River	3,866,269	1,971,797	9%	72	36	36
Edo	4,235,595	2,160,153	10%	80	40	40
Ondo	4,671,695	2,382,564	11%	88	44	44
Imo	5,408,756	2,758,466	13%	104	52	52
<u>Akwalbom</u>	5,482,177	2,795,910	12%	96	48	48
Delta	5,663,362	2,888,315	13%	104	52	52
Rivers	7,303,924	3,725,001	17%	136	68	68
Total	42,637,086	21,744,914	100%	800	400	400

**Source:** NBS, 2017/Authors' computation

### 3.3 Data collection

We reproduced data for the study using participatory rural appraisal (PRA) technique. A written semi-structured interview (SSI) questionnaire, and key informant interview guide were utilized to elicit information from the cross-sectional assessment and key informant interview. The use of PRA was because the outlooks of the people being studied are very essential in realising the objectives of the study. We used the SSI as the main tool for the assessment to glean data from the 800 respondents. The questionnaires were administered directly to the

selected respondents with the assistance of research assistants. The use of local research assistants was inevitable because of the challenges the respondents faced in making sense of the instrument from the pre-test, and the challenges the researcher, on their own part, faced in interacting in the diverse local languages and dialects spread across the many ethnic groups in the rural communities sampled. The local research assistants were of use as well in traversing the rough and uncertain terrain of the region.

### 3.4 Analytical framework

We used propensity score matching (PSM) and logit regression model to evaluate the effect of CSR of MOCs using GMoU on removing the gender gap in nourishment and health in the rural communities of the Niger Delta. Selecting this method was informed by the need to control selectivity and endogeneity difficulties. In this process, to effectually use the propensity score matching, respondents from the CDB communities are congregated as the *treatment* while that of the non-CDB communities are congregated as *control*. This control is an ideal comparison group selected from a larger survey and matched to the treatment based on set of observed features (characteristics). This PSM takes in estimating the effect of intervention or a programme on treatment based on covariates studied for both the treatment and control group. As a result, we detected that deciding to be treated (getting CSR intervention), although not random, is dependent on the variables observed. To this, in assessing the effect of CSR of MOCs making use of GMoU on removing the gender gap in nourishment and health in Nigeria, we denoted the treatment group as  $R_i = 1$  for women and  $R_i = 0$  otherwise (control group) then matched the treatment to the control group on the ground of the propensity score, (Likelihood of obtaining CSR of MOCs using GMoU given observed features).

Therefore, we have that,  $P(X_i) = \text{Prob}(R_i = 1/X_i)$  ( $0 < P(X_i) < 1$ ) (1)

Where  $X_i$  is a vector of pre CSR control variables, if  $R_i$ 's are independent over all 1 and the results are independent of CSR given  $X_i$  then results are also independent of CSR given  $P(X_i)$  just as they would do if CSR are obtained randomly. To draw a definite conclusion on the impact of CSR undertakings on bridging the gender gap in nutrition and health we evaded the choosing (selection) bias on observables by matching on the likelihood of the treatment (covariates  $X$ ). So, we defined the PS of vector  $X$  as:

$$P(X) = \Pr(Z = 1/X), \tag{2}$$

Where  $Z$ = the treatment indicator (=1 treatment and= 0 otherwise). However, due to the fact that the propensity score is a balancing score, the observables  $X$  will be circulated same for both treatment and control and the variances are seen as to the feature of treatment.

With adjustments, we adapted the four steps from the work of Rosenbaum and Rubin(1983)so that the result will be more robust. In the first place, being conscious of the fact that the possibility of getting CSR is predicted by a binary response with suitable observable features, we pooled two individual group, (1 treatment and 1 Control). After this, we evaluated the logit model of getting or not getting CSR as a function of some socio-economic variables that includes personal, family (household)and community variables, thus:

$$P(x)=\Pr(Z=1/X)=F(\alpha_1x_1+\dots+\alpha_nx_n)=F(x\alpha)=e^{x\alpha} \tag{3}$$

We subsequently generated the value of the likelihood of getting CSR from the logit regression allocating each woman a propensity score. The non-CDB women with very poor (low)PS outside the range found for the CDB women were abandoned at this point. For each CDB woman, a non-CDB woman that has the closest propensity score as measured by outright variance in score referred to as nearest neighbour was acquired. This is why we used the nearest five neighbours to make the evaluation more rigorous. We calculated the result indicators' mean values for the nearest five neighbours. The treatment and control variance is assessed by the average treatment effect on the treated (ATT). The average treatment effect on the treated (ATT) is conveyed as:

$$ATT_{PSM} = E_{p(x)} \{E(y_1/Z = 1, P(x)) - E(y_0/Z = 0, P(x))\}, \tag{4}$$

Where  $EP(X)$  stands for anticipation with respect to the circulation of PS in the population. The true ATT shows the mean variance in closing the gender gap in nutrition and health.

We realised a sufficient match of a CDB woman with her counterfactual as long as their observable features are identical. In doing this, we tried three dissimilar matching methods which differ in terms of bias and effectiveness. The diverse matching methods are the nearest neighbour matching (NNM), kernel-based matching (KM), and radius matching (RM).

In the third step, we examined the matching estimators' quality by standardized variances in observables' means between the CDB women and non CDB women. We represented the variance in percent after matching with  $X$  for the covariate  $X$ , the dissimilarity in sample means for treatment as  $(\bar{X}_1)$  and matched control as  $(\bar{X}_0)$ . Following Liebenehm, Affognon and Waibel (2011), we present the sub-samples as a percentage of the square root of the average sample variances:  $(\int_1^2 \text{ and } \int_0^2)$ .

Accordingly:

$$|SD = 100 * \frac{(\bar{X}_1 - \bar{X}_0)}{(.05 \int_1^2 \text{ and } \int_0^2)^{1/2}} \quad (5)$$

Having the outstanding bias below 5% after matching, we took as asignthat the balance among the diverse observable features between the CDB women and the non CDB women is adequate. Generally, while making an allowance for the quasi-experimental design of the CSR of MOCs using the GMoU, there might be a probability that unobservable factors like intrinsic motivation of women and definite abilities or preferences, had influenced the decision to be in treatment or control. We abutted the challenge of hidden bias using bounding method. To this, we complemented equation 3, the logit model to evaluate propensity score by a vector  $U$  having all unobservable variables and their impacts on the possibility of getting CSR and captured by  $\gamma$ :

$$\text{The equation is thus: } P(x)=\Pr(Z=1/X)=F(X\alpha +U\gamma) = e^{X\alpha+U\gamma} \quad (6)$$

We looked at the strength of the effect of  $\gamma$  on getting CSR with sensitivity examination to be able to lessen the effect of getting CSR on potential results. Simply put, the postulation is that the unobservable variable is an adjustable binary taking values 1 or 0. So, the treatment likelihood of both women is applied in relation to the bounds on the odds ratio as stated thus:

$$\frac{1}{e\gamma} \leq \frac{P(X_m)(1-P(X_n))}{P(X_n)(1-P(X_m))} \leq e\gamma \quad (7)$$

With this and in agreement with Rosenbaum (2002), we could dispute that both individual women have the same possibility of getting CSR , as long as they are identical in X, only if  $\epsilon\gamma = 1$

### 3.5 SCOTDI

The MOCs functioning in the Niger Delta carry on facing the problem of how to ascertain the success or failure of their CSR initiatives either as it relates to its effect on community improvement or its impact on corporate-community relations. To address this issue, MOCs in 2013 put into function the Shell Community Transformation and Development Index (SCOTDI). It is an inventive structure that combines and adapts a number of international principles into a fused index in a way that is responsive to local context (SPDC, 2013). The structure (framework) is used here to access and rank the outcome of the dissimilar GMoUs clusters within the host communities of MOCs.

## 4. Results and discussion

### 4.1 Descriptive Analysis

We commenced the examination of the responses in the study with an explanation of some of their demographic (marital status, age household size), social (academic), and economic (occupation, household income) characteristic (Table 2). These features are vital in understanding the variances in the socio-economic and demographic status of the women in the treatment group (from the CDB communities) in comparison to their counterpart in the control group (non-CDB communities) in the Niger Delta region.

**Table 2.** Socio-economic characteristics of women in the Niger Delta Region.

Variables	Treatment Group			Control Group		
	Freq	%	Cum	Freq	%	Cum
<b>Annual Income</b>						
1000 - 50,000	18	5	5	86	22	22
51,000 - 100,000	39	10	14	93	23	45
101,000 - 150,000	65	16	31	83	21	66
151,000 - 200,000	61	15	46	64	16	82
201,000 - 250,000	81	20	66	45	11	93
251,000 - 300,000	88	22	88	14	4	96
Above 300,000	48	12	100	15	4	100
	<b>400</b>	<b>100</b>		<b>400</b>	<b>100</b>	
<b>Primary Occupation</b>						
Fishing	112	28	28	169	42	42

Trading	99	25	53	67	17	59
Farming	72	18	71	58	15	74
Paid Employment	32	8	79	25	6	80
Handicraft	67	17	96	42	11	90
Others	18	5	100	39	10	100
	<b>400</b>	<b>100</b>		<b>400</b>	<b>100</b>	
<b>Level of Education</b>						
None	52	13	13	72	18	18
FSLC	148	37	50	168	42	60
WAEC/WASSCE	117	29	79.25	107	27	87
Degree and above	83	21	100	53	13	100
	<b>400</b>	<b>100</b>		<b>400</b>	<b>100</b>	
<b>Household Size</b>						
1-4 Person	178	45	45	150	38	38
5-9 Person	153	38	83	144	36	74
10-14 Person	57	14	97	76	19	93
15 Person and above	12	3	100	30	8	100
	<b>400</b>	<b>100</b>		<b>400</b>	<b>100</b>	
<b>Marital Status</b>						
Single	67	17	17	75	19	19
Married	203	51	68	285	71	90
Widow	58	15	82	13	3	93
Divorced/Separated	72	18	100	27	7	100
	<b>400</b>	<b>100</b>		<b>400</b>	<b>100</b>	
<b>Age of Respondents</b>						
Less than 20 years	15	4	4	24	6	6
21 - 25 years	124	31	35	101	25	31
26 - 30 years	88	22	57	82	21	52
31 - 35 years	59	15	72	70	18	69
35 - 40 years	46	12	83	45	11	81
41 - 45 years	30	8	91	31	8	88
45 - 50 years	22	6	96	28	7	95
Above 50 years	16	4	100	19	5	100
	<b>400</b>	<b>100</b>		<b>400</b>	<b>100</b>	

**Source:** Computed from the field data by authors

Analysis (Table 2) indicates that while about 57% are 30 years of age or less in the treatment group, only 52% are in a similar category in the control group. This simply indicates that about 31 years is the average age of the treatment group respondents, while age 34 is that of the control. In the same way, while about 8% of women from the treatment have a job (government or private sectors), only 6% also have a job in the control group. This reveals that meagre percentage of the population is engaged in a paid job. Further examination of this shows that



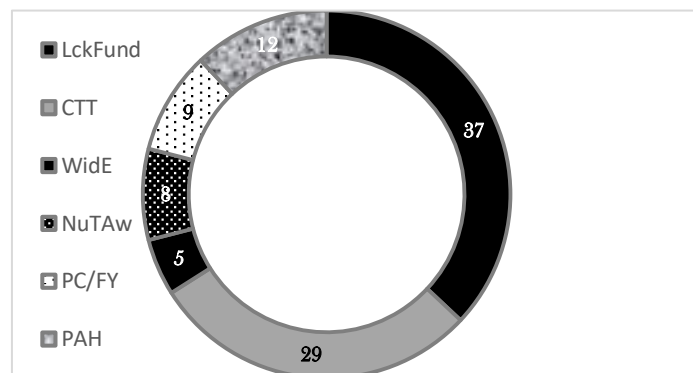
the treatment group has about 28% fishers, 18% farmers, 17% in handicraft and 25% as trader. The counterpart has about 42%, 15%, 11% and 17% respectively. This indicates that because the women in the treatment could access finance more, a large percentage of women have moved into their business since it is more lucrative than the traditional business (farming and fishing). Only about 46% of the CDB women are still involved in the traditional initiatives while 57% of the non-CDB women are in the same category.

In intellectual attainment (Education), only about 13% of the respondent from the treatment lack formal education, the control group have about 18% of their respondents in the same category. This shows that formal acquisition of knowledge is not a key problem in belonging to a CDB or not. In terms of earnings, the treatment and the control show significant but not much dissimilarities. The average annual revenue of both groups is still very poor (low) and a pointer to high level of impoverishment. While in the treatment, the average revenue is ₦200,000 (around \$400) annually, that of the control is ₦90,000 (around \$180). These results have the same outlook and emotion with ACC/SCN (1997), in that women's numerous roles as carers and money earners mean that they cannot always breast feed if they engage in working for long hours in the field or in farm or non-farm commitments. They are more in the offing to be employed in the informal agrarian sector, with poor (low) wages on uncertain part-time or seasonal contracts. This may be due to the fact that they do not have the time to take on a full time contract, and have lower intellectual and literacy level than men. Their economic potential is undervalued, but insecure employment is likely to provide them with some earnings. Services and supplies, such as maternity and paternity leave, child care, or breastfeeding facilities affect child nutrition.

#### **4.2 The intensity of MOCs' CSR interventions in the Niger Delta region**

In answering the first research question, we x-rayed the intensity of MOCs' general CSR involvements in the various sectors. But to be sure their activities affect the nutrition and health of rural women in the Niger Delta region; we first explored the major nutrition and health problems of the women. The examination (Figure 2) indicates that major nutrition and health challenges of the rural women in the Niger Delta region are connected to availability of money to buy food or pay for health services, custom cum traditional taboos, becoming a widow so early in life, poor nutritional and health attentiveness, poor crop yield, and low harvest of fishes cum other sea foods. From figure 2, we observed that, while 12% of the women rated lack of access to healthcare facilities as their main problem, about 9% saw poor crop yield and low

yield in fishing as their key challenge. This reveals that about 88% of the women have some level of access to healthcare facilities. Further exploration shows that the MOCs outside the efforts of the government have made some needful investment in the area of making healthcare available.



**Figure 2:** Percentage distribution of the rural women by major nutrition and health challenges<sup>1</sup>

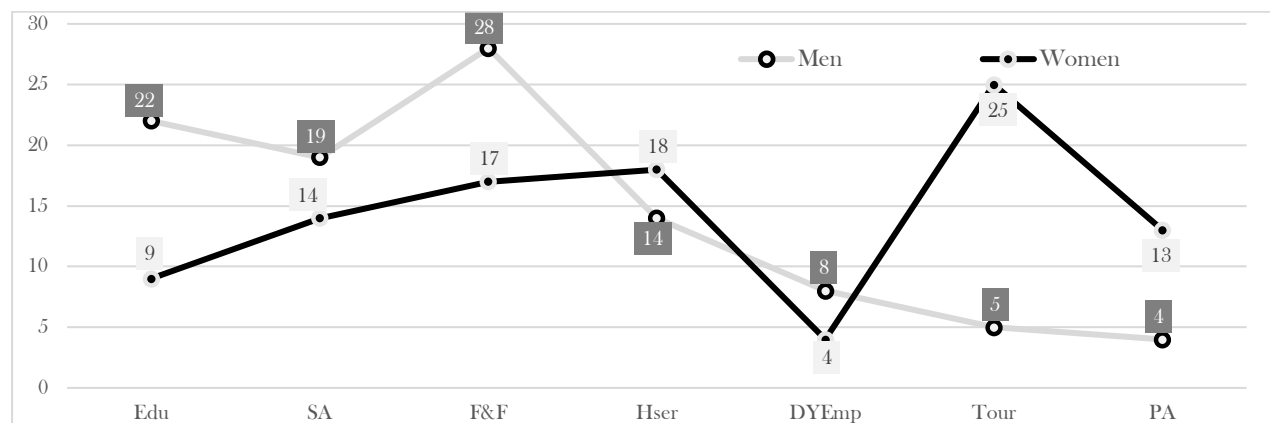
**Source:** Computed from the field data by authors

Nevertheless, many of the respondent (about 37%) complained of unavailability of finance to buy food or even pay for healthcare as their main challenge. The suggestion here is that healthcare facilities may be obtainable but not affordable yet. About 29% have their key issues with custom and tradition that forbid women from feeding on certain nutritious food. Some others, about 5% think their early widowhood is the key problem. In other words, widowhood has an overwhelming impact on their nutrition and health. Furthermore, about 8% complained about lacking nutritionally awareness. This implies that this group needs health and nutritional awareness teaching. These factor identified as major challenges are the reasons behind the low output of the rural women in agricultural productivity. The result gives consent to ACC/SCN (1999), in that nutrition is stimulated by the quality of care made available in a family (household) and community. Rural women are seen as the principal care suppliers, not only because of their procreative role, but also because they are primarily in charge of family (household) food preparation, childcare, and the health cum hygiene of the family. In reality, they face numerous problems in achieving their roles as carers.

Analysis (Figure 3) indicates the degree to which the MOCs have made CSR interventions utilising the GMoUs in various sectors. We did a comparison of how the interventions in the sectors are embraced by the males and females bearing in mind that access to these

<sup>1</sup>LckFund = Lack of fund to buy food or pay for health services, CTT = Custom and traditional taboos, WidE = Widowed very early, NuTAW = Nutrition and health awareness, PCY = Poor crop yield, PhW = Poor harvest from water.

interventions may be different because of some reasons. From this examination, we noted that in the involvements in education (scholarships, bursary and overseas training) that are directly enjoyed by individuals, men got 22% of the interventions while women enjoyed 9%. In the other sectors of their involvement like acquisition of skills, men got 19% while the females received 14%. In making available farming, fishing and sea food collection input, men enjoyed 28% while the women got 17%.



**Figure 3.** Percentage distribution MOCs' CSR using GMoUs by sectors as they affect men and women in the Niger Delta<sup>2</sup>.

**Source:** Computed from the field data by author.

However, in healthcare provision and services, the women enjoyed more (18% of the intervention) while men enjoyed less (14%). Others are direct occupation which the men received 8% while women got 4%. For intervention in the tourism development and enablement, women took 25% of the intervention from CRS while men got only 5%. Also, concerning policy advocacies and social dialogues, most favour women as they recorded 13% while men recorded 4%. This result puts forward that in other to shift social norms that work against women and girls, GMoU investment need to be enlarged in the Niger Delta region. MOCs' participation in a dialogue around legal and policy reform can build up understanding and change attitude amongst main decision makers about the essence of making an allowance for gender equality to better the region's nutrition results.

<sup>2</sup>Edu - Education, SA - Skill Acquisition, F&F - Fishing/Farming, Hser - Health services, DYEmp - Direct youth Employment, Tour - Tourism, PA - Policy advocacy

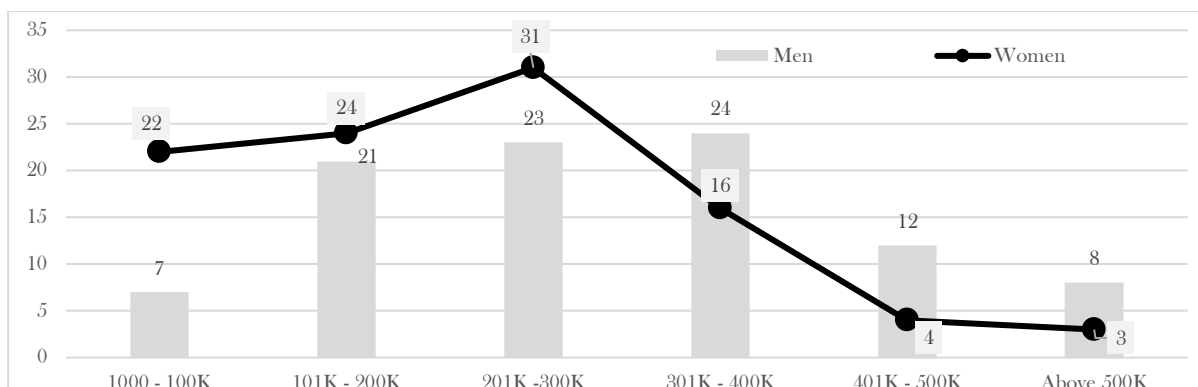
**Table 3.** Percentage rating of MOCs' CSR in helping women with access to nutrition and health in agricultural households in the Niger Delta.

Activities	Agip	Shell	Chevron	Total E&P	Exxon Mobil	Others	Average
Advocacy for changes in food and nutritional taboos	8%	9%	9%	7%	10%	12%	9%
Creating Nutritional and health awareness	2%	4%	4%	6%	3%	5%	4%
Provision of subsidised high yielding inputs	25%	24%	26%	25%	23%	24%	25%
Skill training for women on efficient use of available resources	24%	25%	23%	21%	24%	22%	23%
Provision of family upkeep grant	13%	14%	11%	12%	13%	11%	12%
Provision of hospital/care centres to the people	28%	24%	27%	29%	27%	26%	27%
	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

**Source:** Computed from the field data by authors

A further examination (Table 3) of the involvement of the MOCs that has impacted on nutrition and health reveals that they have financed advocacy for changes in food and nutritional taboos. About 9% of such intervention was aimed at lessening health and nutrition taboos which have worked against the women in the rural communities. Besides, the MOCs have put in about 4% of their interventions on providing nutritional and health awareness. Others areas of their intervention are setting up of subsidised high producing inputs which took up 25%, making available skill training for women on effective use of accessible resources which took up 23%; then, making available family upkeep grant accounted for 12%. Notably, provision of hospital/care centres for people in the region took up to 27% of the MOCs intervention. This result gets along with FAO (2012), in that the ability of women to access health services and information impacts on their health and nutrition. Rural women are often deprived of the freedom or the choice to enjoy such services, especially those living in remote rural areas with terrible infrastructure. It could be because they are illiterate, or that they lack the courage to seek a service. It could also be that their culture prevents them from drifting far from home or from having contact with strangers, especially men.

#### **4.3 Level of Gender Participation in the CSR intervention of the MOCs in the host communities**



**Figure 4.** Direct CSR intervention received from MOCs in the Niger Delta by gender.

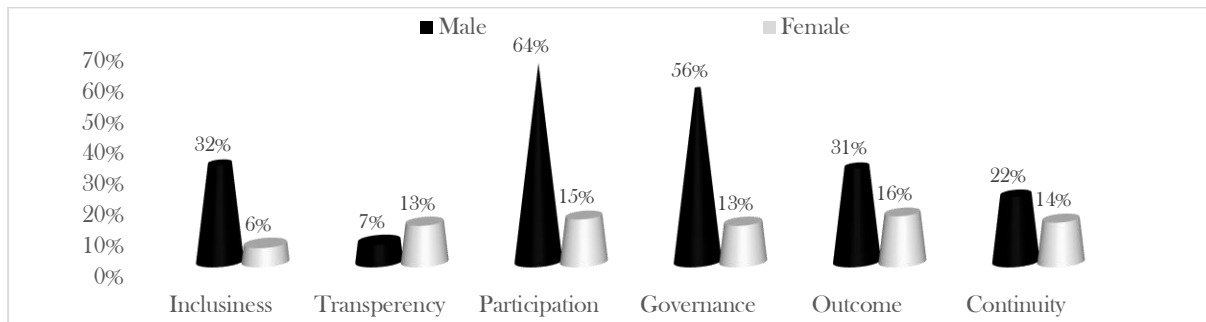
**Source:** Computed from the field data by authors

Analysis (Figure 4) indicates that in receipt of direct CSR intervention from the MOCs, about 46% of the women have been given one form of such intervention or the other from the MOCs that could be valued between ₦ 1,000 - ₦ 200,000 (\$2 -\$400). Only 28% of men were treated in the same way. About 3% of the women have received ₦500,000 (\$1000) and above, while as much as 8% of the men have received such. Also while 12%of the men have been given about ₦401,000 to ₦ 500, 000 (\$802 -\$100), only joust 4% the women have enjoyed such. The implication is obviously that women are trailing behind the men in receipt of direct CSR from the MOCs in the rural host communities. However, it will be totally wrong to believe that the women have not received noteworthy interventions. This result suggests that GMoU interventions can be useful not only as a means of bettering agricultural productivity, or inaugurating an agri-business, but also of sustaining family consumption of food during hungry periods. Rural women, however, do not usually enjoy the same access to GMoU interventions as rural men in the region. The outcomes suggest various reasons for this. One is that social norms may mean they lack the independence or the mobility to belong to CDB clusters. Then, they may not be exposed to the range of GMoU activities, or they may not have the necessary literacy level or poise to belong to CBDs in the region.

To answer question two of the study which is to confirm the level of gender involvement in the GMoU cluster development board (CDBs) in the host communities, SCOTDI was put to use to assess the feelings of the rural women. Seeking the views of the women on issues of this nature is important for these reasons:

- 1) Women’s involvement in control of the cluster development boards.
- 2) Inclusiveness of women in the making of decision of the CDBs.
- 3) Openness in the running of the CDBs

4) Stability (continuity) of the CDBs after MOCs' CSR intervention.5) The result of the GMoUs in the region. The views of the women were necessary for establishing or refuting the claims of the MOCs and the men.



**Figure 5.** Gender involvement in CSR interventions in the Niger Delta Region

**Source:** Authors' compilation based on Field Survey.

In utilizing the SCOTDI structure (framework), analysis (Figure 5), we gave an account of the rating of the women of rural host communities of their participation in the CDBs. The summary of their rating is that MOCs has made notable CSR interventions in Niger Delta, but the women's involvement in all is poor (very low) in comparison to men. Observing the principles in SCOTDI, result shows that openness of the CDBs is mostly low but within the gender, women are better than men in it. While women rated their openness at 13%, they rated that of men 7%. In governance of the CDBs, while the women scored themselves 13%, men got a high score of 56%. This is an indication that the men are in control (dominance) of the running of affairs of the CDB. Also on the principle of inclusion, we observed that women participate poorly in GMoUs through the CDB (6%) while men were rated 32%. This is why the women see the whole process as their not being fully included like their male counterpart. The inclusion rating also shows that just few men are in control of the CDB management as about 68% of them are also excluded outside the staggering number of women (94%). In general involvement in the CSR activities, the women scored themselves 10% while they rated men 64%, revealing that the men hardly ever carry the women along in the GMoU programmes. This result suggests that rural women and girls should be seen as key agents in the war against malnourishment rather than as passive victims in need of assistance. In order to release their potential as change agents, women need to participate in the GMoU interventions so that they can make decisions that will encourage their accessing relevant assets and services in the region.

#### 4.4 Econometric analysis

In determining the variances in means, we observed that scores on access to money, to healthcare facilities cum services, to production input, to improved agricultural productivity, on lowering of cultural taboos, and on improved welfare of women are all soundly significant at 5% significant level. The average variance in the variable measured are about 11%, 18%, 20%, 14%, (-11%), and 15% respectively. Score on efforts to reduce cultural taboos is negative because though it is considerably reduced in the treatment group, the control group is still on the high side. Others measured showed positive signs because the CSR involvements have created a positive upsurge in them. In reverse, the observable characteristics chosen show significant in differences in means as follows: academics (education) with significant positive increase of about 6%; primary occupation with positive (3%); annual income with positive (8%); income of other household members with positive (2%). Moving on, we have Marital Status with 4%, Household Size with roughly 2%. Then, there are observable characteristics that show negative significant mean: one is Age of the respondent with -0.22%; another is Sex of the respondent with about -1%. For the farm level observable characteristics, farm type reveals a mean variance of about 5% which is positively significant; land ownership type has a mean difference of 7% while business experience has a mean difference of about 0.7%.

**Table 4.** Comparison of mean knowledge score and observable characteristics across treatment and Control (N = 800)

<b>Score in Percentage of maximum score</b>	<b>Treatment</b>	<b>Control</b>	<b>Difference</b>
Score on access to fund	29.31	18.51	10.80**
Score on access to healthcare facilities and services	38.92	21.16	17.76**
Score on access production input	34.38	14.68	19.70**
Score on enhanced agricultural productivity	35.32	21.43	13.89**
Scores on reduction of cultural taboos	12.34	23.53	-11.19**
Scores on enhanced welfare of women	43.65	28.52	15.13**
<b>Socio-Economic Characteristics</b>			
Age	21.12	20.75	0.37
Sex	21.1	25.31	-0.96
Education	25.83	20.21	5.62
Marital Status	12.51	13.47	-4.21
Household Size	9.32	10.08	-0.76
Primary Occupation	14.28	12.62	1.66
Annual Income	44.51	32.61	11.9
Income of Other Household Members	18.52	16.43	2.09
<b>Farm Characteristics</b>			
Farm Type	15.26	9.28	5.98
Land ownership type	28.35	19.65	8.7
Source of Input	14.31	10.41	3.9

Farming Experience	14.23	9.34	4.89
<b>Observation</b>	<b>400</b>	<b>400</b>	

**Source:** Authors' compilation based on household survey.

**Table 5.** Logit model to predict the probability of receiving CSR conditional on selected observables<sup>3</sup>

Variables	Coefficient	Odds Ratio	Marginal Effect	Std. Error
Perception of CSR	1.241	10.431	.061*	.052
PriOcc	.319	.962	.120*	.142
Exp	-.021	1.810	-.054**	.132
Edu	.007	1.017	.051**	.012
MS	-.013	1.930	.00135	.130
Age	-.037	.983	.009	.019
AY	-.016	.908	.00114	.042
HHcom	-.319	.562	.0012	.205
Farm size	.017	.954	.0511**	.053
Constant	2.643	6.321	.00621	.467
Observation	800			
Likelihood Ratio - LR test ( $\rho=0$ )	$\chi^2(1)=1243.45^{**}$			
Pseudo R <sup>2</sup>	0.56			

\* = significant at 1% level; \*\* = significant at 5% level; and \*\*\* = significant at 10% level

**Source:** Authors' compilation based on household survey.

We projected the likelihood of gaining from CSR using the chosen features which capture the CDB women and non-CDB women's pertinent observable variances using the logit model indicated in equation 3 of the model. Analysis (Table 5) reveals the estimated coefficients, and the odds ratio conveyed in terms of odds of  $Z=1$ , the marginal effect and standard error. In the result of the prediction in line with MOC's CSR using GMoU, academic attainment of the women, primary employment, and farm size are factors that clearly influence the rural women's access to sufficient nutrition and health in a positive way. However, against expectation, business experience amazingly and undesirably affected the access in a notable way. Ensuing this prediction, we evaluated the average treatment effect (ATT) of CSR on rural women's access to sufficient nutrition and health using the equation 4 specified in the model. This was carried out having cautiously ascertained that the observations are ordered arbitrarily and that

<sup>3</sup>PriOcc = primary occupation of respondents, Exp = business experience of respondent, Edu = minimum educational qualification of respondents, MS = Marital status of respondents, Age = age of respondent, AY = average annual income of respondent, HHcom = per capita income of other household members, Farm size = farm size of the respondents



there are no large discrepancies in the circulation of propensity scores. The result (Table 6) indicates that nearest neighbour matching (NNM) produced the highest and most substantial treatment effect evaluated in all the outcome categories.

**Table 6.** Estimated impacts of CSR interventions on rural women’s access to nutrition and health using different matching algorithms

Description	Access and Knowledge Score in Percentage of Maximum Score		Average Treatment effect on the treated
	Receivers	Non- Receivers	
<b>Nearest neighbor matching</b>	Using single nearest or closest neighbor		
Score on access to fund	29.31	18.51	10.8**
Score on access to healthcare facilities and services	38.92	21.16	17.76**
Score on access production input	34.38	14.68	19.7**
Score on enhanced agricultural productivity	35.32	21.43	13.89**
Scores on reduction of cultural taboos	12.34	23.53	-11.19**
Scores on enhanced welfare of women	43.65	28.52	15.13**
<b>Observations</b>	<b>400</b>	<b>400</b>	
<b>Radius matching</b>	Using all neighbors within a caliper of 0.01		
Score on access to fund	32.14	30.45	1.69**
Score on access to healthcare facilities and services	40.12	32.41	7.71**
Score on access production input	26.17	24.31	1.86**
Score on enhanced agricultural productivity	31.43	24.12	7.31**
Scores on reduction of cultural taboos	22.83	27.31	-4.48**
Scores on enhanced welfare of women	28.42	18.12	10.3**
<b>Observations</b>	<b>400</b>	<b>400</b>	
<b>Kernel-based matching</b>	Using a bi-weight kernel function and a smoothing parameter of 0.06		
Score on access to fund	34.02	27.16	6.86**
Score on access to healthcare facilities and services	26.27	22.18	4.09**
Score on access production input	28.33	25.42	2.91**
Score on enhanced agricultural productivity	28.33	16.41	11.92**
Scores on reduction of cultural taboos	26.14	32.66	-6.52**
Scores on enhanced welfare of women	24.33	21.42	2.91**
<b>Observations</b>	<b>400</b>	<b>400</b>	

\* = significant at 1% level; \*\* = significant at 5% level; and \*\*\* = significant at 10% level

**Source:** Authors’ compilation based on household survey.

The NNM assessment of women’s access to money for buying food and drugs as a result of CSR intervention is about 11%. But, relying on NNM method yielding relatively poor matches

as a result of the limitation of information, our commitment was shifted to the other two matching method (KM and RM). Nevertheless, the projected impact using radius matching algorithm is about 2%, while Kernel-based matching algorithm produces a substantial average treatment effect on the treated in the region of 7%. As a result, it can be established that the CSR of MOCs using the GMoU brings about significant improvements in rural women’s access to nutrition and health; moreover, if invigorated and enriched will increase women’s agricultural productivity thereby lessening the level of impoverishment in the region. In line with the equation 5 as indicated in the model, our third step was to check the unevenness of single observable feature(characteristics) and we observed that the quality of kernel-based matching and radius matching is by far higher than that of the simple method of picking the only closest neighbour in line with the propensity score. The summary, in Table 7, of statistics for the overall balance of all covariates between treatment and control groups confirms the high level of quality of kernel-based matching and radius matching. Both the mean and the median of the absolute standardized variance (difference) after matching are lower than the threshold of 5%.

**Table 7.** Imbalance test results of observable covariates for three different matching algorithms using standardized difference in percent

Covariates $X$	Standardized differences in % after		
	Nearest neighbor matching	Radius matching	Kernel-based matching
Constant	41.6	2.8	4.7
<i>Exp</i>	31.4	2.4	4.3
<i>Edu</i>	31.4	6.4	8.8
<i>AY</i>	9.5	3.8	2.1
<i>PriOcc</i>	11.6	5.3	3.4
<i>Farm size</i>	12.6	2.7	0.5
<i>Age</i>	15.7	3.3	2.1
<i>HHcom</i>	19.4	5.4	2.1
<i>Perception of GMOU</i>	86.4	5.5	6.3
<i>MS</i>	21.5	4.9	2.6
Mean absolute standardized difference	28.11	4.25	3.69
Median absolute standardized difference	11.6	5.3	3.4

**Source:**Authors’ compilation based on household survey.

In the last stage, as indicated in equation 7, we looked at the sensitivity of significance levels. With the awareness that it is the obligation of a fitting control strategy for hidden bias, we made

a comparison of the sensitivity of treatment effects on scores of all the classifications among the three introduced matching algorithms. In all, the result of robustness produced by Rosenbaum's bounds is quite comparable.

**Table 8.** Sensitivity analysis with Rosenbaum's bounds on probability values.

	<b>Upper bounds on the significance level for different values of <math>e^y</math></b>				
	<b><math>e^y=1</math></b>	<b><math>e^y=1.25</math></b>	<b><math>e^y=1.5</math></b>	<b><math>e^y=1.75</math></b>	<b><math>e^y=2</math></b>
<b>Nearest neighbor matching</b>	Using single nearest or closest neighbor				
Score on access to fund	0.0001	0.0112	0.0211	0.0041	0.0311
Score on access to healthcare facilities and services	0.0001	0.0012	0.0231	0.2011	0.621
Score on access production input	0.0001	0.0031	0.0314	0.0118	0.471
Score on enhanced agricultural productivity	0.0001	0.0012	0.0031	0.0321	0.113
Scores on reduction of cultural taboos	0.0001	0.0107	0.0012	0.2121	0.2101
Scores on enhanced welfare of women	0.0001	0.0016	0.0021	0.321	0.211
<b>Radius matching</b>	Using all neighbors within a caliper of 0.01				
Score on access to fund	0.0001	0.0015	0.002	0.0312	0.0032
Score on access to healthcare facilities and services	0.0001	0.0018	0.0021	0.141	0.0261
Score on access production input	0.0001	0.0011	0.0031	0.121	0.0316
Score on enhanced agricultural productivity	0.0001	0.0002	0.0009	0.0081	0.0436
Scores on reduction of cultural taboos	0.0002	0.0012	0.0032	0.021	0.0731
Scores on enhanced welfare of women	0.0004	0.0214	0.1634	0.628	0.0911
<b>Kernel-based matching</b>	Using a bi-weight kernel function and a smoothing parameter of 0.06				
Score on access to fund	0.0001	0.0011	0.0001	0.005	0.0018
Score on access to healthcare facilities and services	0.0001	0.0071	0.0231	0.213	0.0120
Score on access production input	0.0001	0.0016	0.0012	0.0026	0.0124
Score on enhanced agricultural productivity	0.0001	0.0184	0.164	0.485	0.0304
Scores on reduction of cultural taboos	0.0001	0.0315	0.012	0.0421	0.0431
Scores on enhanced welfare of women	0.0001	0.0015	0.0013	0.0021	0.0146

**Source:** Authors' compilation based on household survey.

Analysis (Table 8) reveals that the kernel based matching produced more robust treatment effect than the nearest neighbour matching and radius matching in terms of estimates to hidden bias in the categories. There is a likelihood that matched pairs may vary by up to 100% in unobservable characteristics; while the effect of CSR on the perceived categories would still be significant at a level of 5% ( $p$ -value = 0.0018 and  $p$ -value = 0.0120,  $p$ -value = 0.0124,  $p$ -value = 0.0304,  $p$ -value = 0.0431, and  $p$ -value = 0.0146, respectively). The same classifications of

knowledge score are robust to hidden bias up to an influence of  $e^{-2}$  at a significance level of 10% in line with the radius matching approach.

The findings of this study, in overall, indicate that gender inequality in access to and control of properties is not only unfair to women and their children, but also institute bad economy which results in an unfair distribution of scarce resources, enlarged healthcare costs, reduced productivity, and poor trend in human development. Financing nutrition and health of women is a vital short time barometer in accessing anticipated returns to bettering agricultural household nutrition and overall human improvement capacity in the Niger Delta. The results is in agreement with IFAD (2012), in that working towards improving the nutrition and health status of women in rural areas will better their productive activity in agriculture and revenue-yielding activities. The result also propose that the relative priorities of MOCs' CSR interventions in the Niger Delta should vary from the classic, American ordering, as proposed by Carroll (1991);placing value on a cultural context in the determination of suitable CSR priorities and programmes, as suggested by Visser (2006). But in addition and support, if we are to have our say on how CSR intervention can better gender equality in nutrition and health in agricultural households in the Niger Delta, we would claim that MOCs' CSR can play a vital role in closing the gender variances in nutrition and health when investment is designed to integrate gender-sensitive nutrition/health constituents into GMoU policies and programmes. Hence, taking on gender equality in nutrition and health should be made a priority in CSR practice in the Niger Delta. Such step can contribute towards enhancing the environment for doing business in the region.

## **5. Conclusion and policy implications**

The women of Niger Delta region of Nigeria are very economically active, but their input to the economy is being held back by various restraints. For instance, women still lag behind in education when compared to men, although there has been much progress. The region's overall improvement in access to health-care services has not turned into an equivalent progress in the nutrition and health status of women and girls. PIND (2011) report puts forward that mortality in the region is still a key issues, along with social hindrances, such as women's time apportionment and traditional roles. Thus, we hypothesize as follows:

- CSR of MOCs using GMoU has not been able to substantively impact on rural women's nutrition and health in the Niger Delta region of Nigeria.
- Nutrition and health status of rural women do not really impact on the productivity of women in agriculture in the Niger Delta region of Nigeria.

Women respondents (800 in number) were sampled across the rural areas of the Niger Delta region. The outcomes from the use of a combined propensity score matching and logit model show that CSR of the MOCs making use of GMoU model has massively contributed in closing the gender variance in nourishment and health in agricultural household in the Niger Delta region. The results also reveal that mainstreaming gender in nutrition in the field of agriculture is a critical aspect of solidifying gender and nutrition/health linkages, in acknowledgment of women's notable input in agriculture production and their significant role in household food gathering, preservation/handling and preparation. This puts forward that mainstreaming gender in nutrition offers opportunities to incorporate agriculture and health in handling GMoU projects, which will need increased co-operation and coordination between the MOCs' and CBD clusters in the field of gender and nutrition to positively utilize the current complementary and comparative advantages, and to put on an all-round approach in host communities. This means that gender and nutrition/health have numerous dimensions and are very context-specific. The pathway towards enhanced food and nutrition security for all has to be a gender-fair process integrated into CSR programmes and projects in sub-Saharan Africa.

This research is an addition to the gender discussion in agriculture from a CSR outlook in developing countries and underlying principle for demands for social project by host communities. It closes with the view that business has an obligation to help in resolving problems of public concern. The main caveat of the study is that it directly concerns the oil host communities in Nigeria. Hence, the results cannot be generalized to other African countries with the same policy problems. Based on these limitations, replicating the analysis in other countries is advisable in order to ascertain whether the established nexuses hold out empirical scrutiny in diverse rural contexts of emerging countries.

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