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Consumer awareness of food fortification in Kenya: The case of vitamin-A-fortified sugar

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Abstract

Food fortification is considered as an important strategy to address micronutrient malnutrition, which is a key challenge in most developing countries. In Kenya, the National Food Security and Nutrition Policy focus on pilot efforts on food fortification. However, lack of empirical information on consumers' awareness for fortified foods remains the barrier to the uptake of these enriched foods. This study assessed the consumers' awareness and analyzed factors affecting levels of awareness for fortified sugar. Awareness was assessed using descriptive statistics while binary logit model was specified to analyze factors affecting the levels of awareness. The study used primary data from a random sample of 350 consumers in Nairobi County (a completely urban setup), and Kakamega County (a relatively rural setup). The study found that about 55% of the households were aware of fortified sugar and that awareness levels were statistically higher for urban consumers. However, only 26% of the respondents were aware of the importance of vitamin-A in their diets. Results from binary logit regression showed that age of consumers, purchasing from supermarket, reading newspaper, dwelling place (urban or rural) as well as having a child below the age of five years, were the significant factors influencing consumers' awareness of fortified sugar. These findings offer useful insights for the development of preference-based sugar fortification programmes in Kenya. Moreover, the results would guide formulation of policies against micronutrient malnutrition in Kenya and other developing countries, with similar conditions.

Key words: Fortification, vitamin-A, consumer awareness, binary logit

1. Introduction

Food quality, safety and availability are globally considered important aspects for human development. These entail access to nutritious and balanced diet that comprises carbohydrates, proteins, roughages, vitamins and minerals. Good nutrition is a prerequisite for human health and labour productivity (Caballero, 2003). Food quality is often conceptualized in the context of food energy or calorie intake. However, it is increasingly recognized that a large segment of the world's population especially in developing countries, consume foods that are deficient in some micronutrients (Kimenju et al., 2005).

Among the nutritional deficiencies, lack of sufficient amount of vitamin A (VA) and iron has the greatest impact on public health (WHO, 2006). Vitamin A deficiency (VAD) is a major problem that is not necessarily limited to specific groups of people or isolated communities. An estimated 250,000 to 500,000 VA-deficient children go blind every year (West Jr. and Darnton-Hill, 2001). A part from acute eye symptoms, VAD also weakens the immune system, thus increasing the severity of infectious diseases and infant mortality rates. For adults, the severity of VAD is higher among pregnant and lactating women. For instance, it is estimated that about 600,000 women die from childbirth-related complications each year, many of which could be reduced through better provision of vitamin A (IVACG, 2003).

VA is mainly obtained from animal sources in the form of retinol. VA from plant sources is less easily absorbed and utilized by the human body (less Bio-available) than the VA coming from animal products (Kimenju et al., 2005). Since VA from plant sources is usually found in large amounts in only a few fruits and vegetables, many of which are highly seasonal, low income populations may suffer from VAD unless VA is available in processed foods such as sugar, oils, and staples (WHO, 2006). Several approaches have been developed to reduce VAD worldwide. In Kenya, supplements are provided to children through vitamin A capsules, typically every six months. An alternative to supplementation is dietary diversity, by creating awareness about the problem in affected communities and increasing use of foods that have relatively high levels of pro-vitamin A from home gardens and other sources. However, these strategies suffer low coverage due to logistic difficulties and complexities (KNFFA, 2011).

The third approach is to enrich processed foods with pro-vitamin A carotenoids through food fortification. This is the practice of increasing the content of an essential micronutrient, such as vitamins and minerals, in a food irrespective of whether the nutrients were originally in the food

before processing or not (WHO, 2006). Success stories from Guatemala suggest VA-sugar fortification could prove to be an essential strategy for combating VAD in Kenya, which has high rates of micronutrient malnutrition. Over 70% of children and 33% of women of childbirth age in Kenya, for example, suffer from the severity of infectious diseases and infant mortality rates while over 30% of children suffer from acute eye symptoms (KNFFA, 2011), which are the outcomes of VAD. At the same time, as is the case in many developing countries, access to food supplements and animal food products' that supply vitamin A directly in form of retinol, is limited (Gonzalez et al., 2010).

1.1 The research problem

Recent reports suggest that food fortification could be a cost-effective strategy to addressing micronutrient malnutrition in developing countries (van Stuijvenberg et al., 2001; IVACG, 2003). Further, among other advantages, food fortification doesn't require people to change their eating habits, thus the "target" population continues to eat the food chosen as a "means" which, once fortified, becomes a good source of the micronutrient (Qaim et al., 2007). However, food fortification is just gaining momentum in Kenya, and thus relatively little empirical information is known about its actual implication to consumers.

The awareness levels of Kenyan sugar consumers regarding VA sugar fortification and its nutritional importance might pose a barrier to acceptance of fortified sugar. Consumers are the sole determinants of the success of industrial food fortification initiatives through their purchase decisions. The potential for sugar fortification programme therefore, relies solely on the level of consumers' awareness. However, there is a dearth of knowledge on consumer awareness and purchase decisions regarding sugar fortification and its usefulness. Therefore, this study examined the awareness levels of Kenyan consumers to VA sugar-fortification and assessed whether food demand and consumption characteristics had any effect on the level of sugar fortification awareness observed. The study specifically; i) explored awareness of sugar fortification and compared the levels of awareness between rural and urban sugar consumers; ii) assessed the socioeconomic and food demand characteristics that influences consumer awareness of fortified sugar. The key research question is how consumer' awareness levels observed compares along the rural-urban axis.

2. Methods

2.1 Sampling and data collection

The target population included households residing in the County of Nairobi (which hosts the capital city) and Kakamega (which lies to the western region of Kenya). The survey was implemented through face-to-face interviews conducted in March and April 2013. This method of data collection was preferred because the respondents' concerns and questions could be addressed at hand by the interviewers, and further clarifications given instantly. Personal interviews also guaranteed higher response rate and made the use of visual aids and assisting respondents when necessary possible. This method was also instrumental in ensuring that only members of the household who are primary food shoppers answered the questionnaire.

The sample was drawn using a multistage sampling procedure, and stratified into rural and urban consumers, with Nairobi County representing urban and Kakamega representing rural setup. Multistage sampling method was used in this study because the listing of all households in the study areas was not available. Moreover, the anticipated consumption diversity within the study areas in terms of dietary requirements, socioeconomic and sugar demand characteristics rendered the method most appropriate.

The two counties were divided into smaller administrative units called districts. Within each district, a random sample of locations was drawn, from which a number of smaller administrative units (sub-location) were drawn. Within the sub-locations, smaller units (Villages in Kakamega County and Estates in Nairobi County) were randomly selected, which formed the secondary sampling units. The primary sampling units were the households, supermarkets and clinics, from which primary household sugar-shopper's (respondent) was drawn using a systematic random sampling criterion. More importantly, to select the households, a cross-sampling method was used; that is, a cross "X" was drawn on the village map and every nth household ('n' equals five and ten where households were scattered/far apart and congested, respectively) along the "X" with a random start was interviewed (Birol et al., 2011). Where the targeted respondent was unavailable or uninterested in participating, the next randomly selected household on the list was chosen to ensure that the desired sample size was realized. Employing sampling proportionate to size criterion, the total sample size was 350 respondents.

The survey collected three types of data concerning consumers' purchasing behavior. Respondents were first asked about their frequency of sugar consumption (daily, weekly etc.),

quantity of sugar consumed in a typical month as well as preferred sugar-purchase outlet (kiosk, retail shop or supermarket). They were also required to rate five product characteristics – price, taste, nutrition, brand, and additional health ingredients – according to their level of importance in influencing food purchase. The rating for each characteristic was based on a five-point Likert scale, including; not at all important (1), somewhat important (2), moderately important (3), fairly important (4), and very important (5). The survey elicited additional data on consumers' awareness of sugar fortification, knowledge of vitamin A and trust in organizations handling regulation and control of production, sale and release of the aforementioned product. Finally, the enumerators collected social, demographic, and economic information on the households, including the age, education, income, household size (composition) and characteristics of the sugar purchase decision-maker(s) and other members of the household. The surveys were conducted by six enumerators specially hired and trained, and supervised by the researcher. Data was collected during daytime in Kakamega and on weekends, and weekday afternoons when a member of the selected target population would most likely be at home in Nairobi. Each questionnaire took an average of one hour to administer and each enumerator managed to complete about five questionnaires per day.

2.2. Model specification

A binary (binomial) logit model was applied to investigate determinants of consumers' probability to be aware of fortified sugar. The awareness of fortified sugar can be modelled as a choice between two alternatives: aware or not aware. The binary random variable Y_i takes the value of 1 if the consumer is aware and zero otherwise.

$$Y_i = \begin{cases} 1 \; if \; aware \\ 0 \; otherwise \end{cases}$$

The dependent variable is discrete which therefore, renders the employment of binary logit model most appropriate. The probability that individual i is aware can be modelled as Greene (1993):

$$\text{prob}\left[y_{ij}=1\right]=\frac{\exp\beta'X_i}{1+\exp\beta'X_i}=\Lambda\,(\beta'X) \qquad 1$$

The subscripts *i* and *j* denote consumer and consumer awareness (1=aware, 0=otherwise), respectively. Equation (1) is the reduced form of the binomial logit model, where the x_i is the row vector of explanatory variables (both socioeconomic and food demand characteristics) for the $_i$th consumer and the non-observed ε*'s* accounts for errors in perception and measurements. The errors are assumed to follow a distribution of logistic probability with a density function:

$$F'(\beta'X_i) = \Lambda(\beta'X_i)[1-\Lambda(\beta'X_i)] \qquad 2$$

The probability that individual *i* is aware is estimated empirically as:

$$\Pr[Yi = 1] = X_i\beta_i + \varepsilon_i \qquad 3$$

X is a vector of socioeconomic and food demand characteristics that are posited to influence consumers' awareness of sugar fortification; β_i is a vector of parameters to be estimated, while ε_i is the statistical random term specific to individual sugar consumer.

Additionally, marginal effects were estimated (on the pooled sample), to measure instantaneous effects of changes in any explanatory variable on the predicted probability of being aware, while holding other explanatory variables constant. The marginal effects are computed as (Anderson and Newell, 2003):

$$\beta_m = \left[\frac{\partial(\beta_i X_i+\varepsilon_i)}{\partial\beta_i X_i}\right]\beta_i \quad \text{for continuous independent variables} \qquad 4$$

$$\text{Or } \beta_m = P_r[Y_i=1] - P_r[Y_i=0] \quad \text{for dummy-coded variables} \qquad 5$$

The binary logit model and marginal effects were estimated using LIMDEP version 8/ NLOGIT version 3.0 software (Greene, 2002), descriptive statistics analysed using the statistical package STATA, version 10.

3. Results and discussions

3.1. Characteristics of the respondents and their households

The socioeconomic characteristics of the sample are presented in Table 1. More female respondents (55%) answered than males (45%) because individuals in the study areas were selected based on availability and responsibility for food purchase in the household. The implication is that female members' shoulders heavy responsibility in terms of household food purchase decisions and therefore, should be targeted for nutrition information programmes. Respondents' average age is 35 years (varying from 18 to 85 years). Persons younger than 18 years were not selected for the interviews as it was assumed that the younger sugar consumers had less experience in shopping and would give biased responses (De Groote et al., 2010).

Table 1: Socioeconomic characteristics of the respondents

Variable	**Kakamega** N = 162	**Nairobi** N= 188	**Pooled** N = 350
Average age of respondent (years)	36.4(12.2)	33.9(9.0)	35.1(10.6)
Average household income (Kshs)	23700(18898)	43300(34058)	34200(29698)
Average household size	5.1(2.7)	3.1(1.6)	4.0(2.2)
Average Years of schooling completed	10.6(3.6)	13.1(2.8)	11.9(3.4)
Level of education (%)			
Primary	30.9	12.2	20.9
Secondary	40.1	30.9	35.1
College/Diploma	19.8	37.8	29.4
Bachelor degree	6.8	14.4	10.9
Other (MSc, PhD)	0	4.8	2.6
Gender of respondent (% Female)	56.8	53.2	54.9
Aware of VA fortified sugar (% Yes)	46.3	62.8	55.1
Have consume fortified sugar (% Yes)	29.0	38.8	34.3
Aware of the importance of VA (% Yes)	19.6	29.4	26.1
Household has at least one member below 5 yrs (% Yes)	58.6	55.3	56.9
Frequency of consuming sugar (% Daily)	97.5	99.5	98.6
A member of an organization/ group (% Yes)	85.1	77.2	81.4
Usually read labels while buying sugar (% Yes)	31.5	49	40.8

* Standard deviations are in parentheses (for continuous variables).

Group statistics shows that 46% of the rural consumers and 63% of the urban consumers are aware of VA fortified sugar. The independent sample test for the means of awareness levels for urban and rural consumers' (t-test for equality of means) shows that the awareness levels for urban consumers is statistically higher than for rural consumers, at 5% significance level (i.e. the *p value* < 0.002).

The mean number of years of formal education of the respondents is 11.9, with approximately 13.5% of the respondents having a university education (at least bachelor degree). The average household size in the sample is 4.0. The average monthly household income was approximately Kenya shillings (Kshs) 34,200. These figures (for education and income) are relatively higher compared to those reported by other studies in Kenya (Kimenju et al., 2005; Adolwa et al., 2012). Therefore, respondents are expected to have high levels of awareness since education and income should translate to increased information. The high level of education is important to nutrition information dissemination as it enhances grasp. The study also gave special attention to expectant and lactating women, given that children and pregnant women are the most vulnerable to VAD (KNFFA, 2011).

In general, only 26% of the sampled households were found to be aware of the importance of VA in the human body. The figure compares unfavourably to 34% who have consumed fortified sugar and 55% who were aware of sugar fortification. The rationale is the need for targeted VA-awareness programme. Approximately 57% of the households had children younger than 5 years while 19% had elderly occupants-above 50years. These two segments are the most vulnerable to the effects of VAD and their inclusion significantly improves the policy relevance of the study.

With regard to frequency of sugar consumption, almost all the respondents (98%) consume sugar daily either in tea, porridge and other commodities (e.g. bread, cakes, biscuits, soft drinks, other beverages and confectionary products). This confirms the suitability of sugar as an avenue of fortification, which is best justified in terms of frequency of consumption by the target population rather than the quantity consumed (WHO, 2006). Rural consumers acquire about 67% of their food fortification information from the media (i.e. radio, television and newspaper), while only 9% from observation and purchase. Whereas in the urban areas the contribution of media drops to 55% while that of observation and purchase rises to about 26%. Therefore, dissemination of nutritional information through the media would be more effective

in the rural areas. Urban areas would require the use of other avenues such as internet options, mobile phones and even organized displays at the supermarkets.

Table 2: Consumer purchase behaviour

Source of food fortification information (%)					
	Observation	Purchase	Seminars	Media	Internet
Kakamega	2.5	6.8	2.5	66.7	0.5
Nairobi	9.6	16.5	0.5	54.8	1.6
Pooled	6.3	12.0	1.4	60.3	0.9
Frequency of reading labels during purchase (%)					
	Never	Rarely	Occasionally	Often	Always
Kakamega	29.6	12.3	26.5	22.2	9.3
Nairobi	8.5	27.1	15.4	43.1	5.9
Pooled	18.3	20.3	20.6	33.4	7.4
Frequency of purchase Supermarket (%)					
	Never	Rarely	Sometimes	Often	Always
Kakamega	39.5	30.9	21.6	7.4	0.6
Nairobi	2.1	21.7	21.9	37.2	17.0
Pooled	19.4	26.0	21.7	23.4	9.4

Ranking factors influencing sugar purchase decisions (% Respondents)				
Taste/Flavour	Price	Nutritional Information	Brand Name	Additional health Information
91	88	70	65	45

More so, majority of urban consumers purchase sugar from supermarkets and would acquire significant information from such displays. The results show that only 8% of the rural consumers usually purchase sugar from the supermarket while about 70% purchase from kiosk. This trend is reversed in urban areas where 54% of consumers frequent supermarkets with only 37% usually purchase sugar from the kiosk (as reported in table 2.). Therefore, it is consistent

that urban consumers get about 26% of food information during purchase activities because most of them purchase food items from the supermarket, where goods are well displayed and more information given through proper labeling (Weatherspoon and Reardon, 2003).

To determine the most important factors that influence purchase decisions, consumers were asked to rate five product characteristics – price, taste/flavor/colour, nutritional information, brand name and additional health ingredients' information, for example, fortification label, on their purchase decision– according to their level of importance prior to purchasing sugar, using a Likert scale ranging from not at all important (1) to very important (5). Following Gonzalez et al. (2010), the definition of the ''most important factor'' was based on the number of consumers responding to the top (4–5) scale levels, that is, fairly important and very important, as reported in Table 2. On average, taste/flavor/colour (91%), price (88%), and nutrition (65%) are the most important consumption factors, brand name ranked fourth at (65%) while an additional health ingredient was ranked last at (45%). This suggests that price and sensory characteristics (measured as taste/flavor/colour) are ranked higher than nutrition, by the majority of sugar consumers' in Kenya. These results compares to those reported by (Harris, 1997), and indicate that some consumers may not accept nutritious (fortified) foods if changes occurs to the sensory characteristics regardless of their awareness levels.

3.2. Factors influencing consumer awareness

Table 3 shows the factors hypothesized to influence consumers' awareness of fortified sugar that were selected for the binary logit regression. Following Neven and Reardon (2004), frequent purchase from supermarket is expected to increase consumers' awareness regarding fortified sugar. This is due to the additional information offered by these purchase outlets through skilful display of goods as well as frequent advertisement of products via numerous media. On the same note, reading newspaper frequently is expected to increase consumer awareness through provision of food information.

Table 3: Description of factors affecting consumer awareness

Variable	Description of the variable	Expected sign
PSUPER	Purchase from supermarket (1=Yes, 0=No)	+
RNEWSPA	Read newspaper (1=Yes, 0=No)	+
MSTATUS	Marital status of respondent (1=Married, 0=Not married)	+
AGE	Age of respondent in years	±
GENDER	Sex of respondent (1=Female, 0=Male)	±
REGION	Location of respondent (1 =Urban, 0=Rural)	+
EDUCYRS	Formal years of schooling	+
INFMEM	Household has at least one member below 5yrs (1=Yes, 0=No)	+

Media is the most important source of food nutrition information and fortification awareness. As reported in Table 2, 60% of the respondents acquire food information from the media (using pooled sample). Specifically, Radio is used by 91% of the respondents while 70% of them use Television in most cases. These two media sources therefore, offer little variability in terms of consumer-usage and were consequently excluded from the regression model. Newspaper (used by 43% in urban and 34% in rural areas) was included in the regression model to represent media.

Households with infant-members are expected to have high levels of awareness (Birol et al., 2011). This is because these households frequent public clinics where the government has an ongoing programme on vitamin A supplementation, and where they are the prime targets (De Groote et al., 2010). Other than provision of vitamin A supplementation in form of capsules, the programme also entails education on nutrition where food enrichment comes in handy. These households therefore, acquire more information regarding nutritional value of foods and are expected to be more aware of VA-sugar fortification programme.

Suitability of the above selected factors for econometric analysis was tested for multicollinearity. This was tested using the variance inflation factors (VIF), which was computed for each of the consumer characteristics. The VIF computation involves estimation of 'artificial' ordinary least squares (OLS) regressions between each of the consumer characteristics as the

'dependent' variable with the rest as dependent variables (Long, 1997; Otieno, 2013). The VIF for each factor is calculated as:

$$VIF_i = \frac{1}{1- R_i^2} \qquad 6$$

Where R_i^2 is the R^2 of the artificial regression with the ith independent variable as a 'dependent' variable. The mean VIF was 1.4 with individual VIF ranging from 1.0 to 1.9 indicating absence of multicollinearity. Maddala (2000), suggested that variables with VIF<5 have no multicollinearity; hence they were selected for inclusion in the binary logit regression.

Among the regressors, age of consumers, purchasing from supermarket, reading newspaper, living in urban area as well as having a child below the age of five years, are the significant factors that influence consumers' awareness of sugar fortification, while marital status and years of formal education had insignificant effect (results in Table 4). Whereas the coefficient values explain the probable influence of each regressor on awareness generally, the marginal effects measure the actual effect of instantaneous changes in each of the explanatory variables on consumers' awareness levels (Greene, 1993; Anderson and Newell, 2003).

Age of consumers negatively and significantly influence consumers' awareness of sugar fortification. The result implies that younger age group consumes sugar and is more likely to be aware of sugar fortification. The marginal effect results shows that an increase in age of the sugar consumer by one year reduces the probability of being aware of sugar fortification by 1%. The explanation could be that older consumers precisely shop for what they are used to since they are conservative in nature. Moreover, the information has gone digital in Kenya due to technological advancement so that even food advertisers seek new avenues so as to keep track with the changing times (Okello et al., 2009). Internet options and mobile phone usage have provided the medium for the new advertisement opportunities that targets mostly technologically advanced consumers. The younger sugar consumers get favor in these new avenues which may explain their high level of awareness.

The influence of media on sugar fortification awareness in this study is represented by reading newspaper. The results indicate that reading newspaper positively affects awareness of sugar fortification. Specifically, the marginal effect shows that reading newspaper instantaneously increases the probability of the consumer being aware of sugar fortification by

32%. The newspaper purposes to provide information including food as well as technology advertisement to the readers thus increasing their knowledge (for example, the daily nation newspaper every Wednesday has a section on nutrition, entitled 'all about food', in the DN_2-Daily Kenya Living Magazine).

Table 4: Factors affecting awareness

Variable	Kakamega	Nairobi	Pooled	Marginal Effects
PSUPER	0.223	4.535***	2.955***	0.512***
	(0.675)	(0.699)	(0.451)	(0.053)
RNEWSPER	1.186**	2.342***	1.597***	0.322***
	(0.432)	(0.565)	(0.319)	(0.06)
MSTATUS	- 0.543	0.295	- 0.01	- 0.022
	(0.553)	(0.748)	(0.401)	(0.093)
AGE	- 0.025**	- 0.058**	- 0.03**	- 0.008**
	(0.011)	(0.024)	(0.01)	(0.002)
GENDER	- 0.639**	0.36	- 0.31	- 0.076
	(0.338)	(0.521)	(0.27)	(0.068)
REGION	_	_	0.499*	0.105*
			(0.305)	(0.078)
EDUCYRS	0.043	- 0.048	- 0.038	- 0.004
	(0.042)	(0.724)	(0.033)	(0.008)
INFMEM	0.773**	0.465	0.681**	0.159**
	(0.343)	(0.536)	(0.278)	(0.063)
Log-likelihood	- 98.72	- 51.13	- 166.0	
Pseudo-R^2	0.11	0.58	0.31	
χ^2 (ρ- value)	26.25(0.02)	145.98(0.0000)	149.48(0.0000)	
N (respondents)	162	188	350	

Notes: Standard errors in parentheses; statistical significance levels: ***1%; **5%; *10%. Marginal effects are calculated for the pooled sample only.

Consumers whose major sugar purchase outlet is the supermarket have higher probability of being aware than those who frequent other outlets such as retail stores, shops and open markets. This finding corroborates those reported by Lupin and Rodriguez (2012). The result shows that purchasing from a supermarket increases the probability of being aware of sugar fortification by 51%. In fact, this study finds purchasing from a supermarket the major

determinant of consumer awareness of sugar fortification followed by reading newspaper. The reason for this lies in the 'demonstration effect' as consumers are able to see, read labels or even touch fortified sugar on display while purchasing from the supermarket. Other than proper display of goods, supermarkets also offer shopping choices and ambiance through skilful and attractive arrangement of goods; advertise through posters, billboards and even media. All these aspects promote consumer awareness and are less synonymous with other purchase outlets (Neven and Reardon, 2004; Weatherspoon, and Reardon, 2003).

According to Knight et al. (2003), larger sections of urban consumers may feel less pressured to seek discounted prices generally offered by retailers and, in addition, may not experience the subsistence type of living associated with kiosk outlets; that is, daily shopping for small individual food items. Furthermore, to shop at other outlets would not be in keeping with the image associated with a certain socio-economic standing. This contrasts with the experiences of those respondents in the rural areas, who, because of poverty and low income, are forced to seek the best value for their shilling from small shops that break goods in smaller quantities.

Households with some members below the age of 5years are also likely to be aware of sugar fortification with vitamin A. This is because more information regarding nutrition and nutritious foods, which is the sole aim and target of food fortification, is provided to them when they visit the public clinics (IVACG, 2003). The result from this study is in tandem with this expectation as it reveals that having a preschool child in the house increases consumers' probability of being aware of sugar fortification by 16%. These results concur with those of Birol (2011). Furthermore, availability vitamin A supplementation programme (for instance, by the government) increases the awareness levels of these households, since they are the prime target of vitamin A supplementation programme (KNFFA, 2011).

Geographic region also positively and significantly affects the probability of being aware of sugar fortification. Specifically, residing in an urban region increases the probability of being aware by about 50%. These results corroborates the findings of De Groote et al. (2010) that consumers' proximity to urban areas increased awareness and preference for yellow versus fortified maize. The marginal effect shows that an instant migration from rural area to an urban area increases the probability of consumer awareness by 11%. This can be attributed to a number of factors including, increase in information infrastructure and sources in urban areas as well as

increase in the number of supermarkets that increases the frequency of purchasing from these purchase outlets.

The effect of gender is insignificant for urban consumers' awareness; perhaps suggesting uniform access to information by male and female in the urban areas (some level of gender parity). However, the effect of gender is negative and significant for the rural consumers. The result shows that female consumers in the rural areas are on average 64% less likely to be aware of sugar fortification than the males. This can be attributed to the fact that males usually dominate the household resources, which includes information (Kaliba et al., 2000). The result contradicts the findings of Adesope et al., (2010), who found that female consumers in northern Nigeria were more likely to be aware of safety labels in sugar, a fact which the authors attributed to their roles regarding food purchase and preparation. In Kenya, this study has established that majority of female consumers in the rural areas purchase sugar from retail shops and kiosks. Such outlets offer little information to these consumers (negligible demonstration effect) so that their awareness levels are still low regardless of their greater roles in terms of food purchase and preparation. Moreover, such outlets usually repackage sugar into smaller-unlabeled packets, reducing chances of consumer awareness/information (Knight et al., 2003).

4. Conclusions

This study found that consumers' awareness of sugar fortification in the study areas was higher for urban consumers. The study also established the fact that purchasing sugar from supermarket, age of the consumer, reading newspaper, location in urban area and household having infant member(s) significantly influences consumer's awareness of sugar fortification. In addition, marital status and the years of formal education of the consumers' had insignificant influence on the level of consumer awareness, contrasting the prior expectation of the study. Consumers still value/perceive price and changes in sensory attributes highly compared to nutritional attribute when faced with a choice between fortified and conventional sugar. Care must therefore, be taken to ensure that fortificants that maintains the sensory characteristics of food are used in the fortification process. This would enhance wider acceptability among consumers.

Public nutrition education programmes which are designed to create and maintain awareness need to be developed to target a specific region. The finding that females are less likely to be

aware compared to males, particularly in rural areas, imply that these nutritional programmes should also be packaged with programmes that promote gender roles. In this regard, little may be achieved through blanket usage of media in nutritional education, given that the study revealed exclusive control of media and other information resources by the males. Therefore, use of groups in the society such as women groups, churches and other non-profit organizations are encouraged to supplement media sources. A number of studies have revealed that access and use of mobile phones in Kenya is high (Okello et al., 2009). Dissemination of nutritional information through mobile phones (short messages) should be considered. Finally, younger generation (whose access to media and phones is low), can also be targeted for nutritional information in schools. The study suggests introduction of Nutrition Education as well as formation of nutrition/dietary awareness clubs in both primary and secondary schools.

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