Are Base of Pyramid (BoP) Consumers Willing to Pay for Nutritious Foods? Evidence from Kenya and Uganda

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The Base of the Pyramid (BoP) consumers living in the urban informal settlement of developing countries spend over 60% of their income on food, yet malnutrition and micronutrient deficiency remains widespread among this population, pointing to the inadequacy of the foods they consume in terms of quality and quantity. In this paper we examine BoP consumer willingness to pay (WTP) for safe and nutritious multi-composite porridge flour (improved flour) in the informal settlements of Nairobi, Kenya and Kampala, Uganda. In 2016, we collected primary data from 600 consumers in the informal settlements of Kampala, Uganda and Nairobi, Kenya (300 in Kenya and 300 in Uganda). We use Tobit regression models to analyse determinants of WTP for the improved flour. Results show that both Kenyan and Ugandan consumers are willing to pay a premium for the improved flour. In addition, providing nutrition information of the flour, characteristics of household head, economic status of the household, and presence of young children between 6 and 59 months in the household influence WTP for the safe and nutritious porridge flour. The paper concludes by providing recommendations for enhancing nutrition among poor consumers in the informal settlements of developing countries.

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KEYWORDS: Willingness to Pay; Base of Pyramid Consumers; Informal Settlements; Nutritious Foods; Malnutrition; Kenya; Uganda; Developing Countries

Introduction

Globally, malnutrition is approximated to contribute to more than one third of all annual child deaths (Bain, 2013; Black, 2013; Bhutta, 2013). However, it is rarely shown as the direct cause due to the vicious cycle of diseases and poverty which aggravate the situation (Bain, 2013). In addition, maternal and child malnutrition still remains a major health challenge in Africa especially among the Base of Pyramid (BoP) households (Black, 2013). Malnutrition challenges are attributed to stunted growth, sub-optimal breastfeeding and deficiencies of micronutrients like zinc, vitamin A, iodine and iron in children's diets (Black, 2013; Bhutta, 2013).

There have been widespread and different attempts to improve diets in developing countries hence reduce malnutrition. Among them include fortification of staple foods with micronutrients such as iron, zinc, and vitamins, (e.g. adding vitamins to wheat flour), bifortification (e.g. breeding of iron-rich beans and orange-fleshed sweet potato), supplementation, behaviour change interventions, and dietary diversity (Candace, 2013; Das *et al.,* 2013; De Groote *et al.,* 2017; Faber, 2005; Gupta, 2015). Dietary diversity entails consuming a variety of foods so that the consumer benefits from the diverse nutrients (macro and/or micro nutrients) provided by those foods. As such, it is considered a reliable source of micro-nutrients like iron, zinc and vitamin A that can potentially reduce deficiency diseases such as anaemia and also help improve nutritional status and growth of infants especially among the poor in developing countries (Faber, 2005; Candace, 2013; Das *et al.,* 2013). Additionally, composite porridge consisting of cereal and legume ingredients has been recommended as a sustainable low cost supplementary food source to help improve the health of the vulnerable poor, the sick and children (Candace, 2013).

When dealing with the resource poor consumers (those at the Base of the Pyramid), it is important to find out whether these consumers are willing to pay for the improved and nutritious foods being recommended as potential remedies to reduce undernutrition in developing countries. Willingness to pay (WTP) experiments are often used to elicit whether consumer are willing to pay for such products. WTP for supplementary foods such as multi-composite porridge flour has been studied in various settings, and the findings show that they attract different levels of willingness to pay (WTP) based on the perceived value consumers attach to the different ingredients included in them. Previous studies show that consumers are more willing to buy

multi-composite porridge flour if they perceive the ingredients will improve their overall nutritional status and health (Candace, 2013; De Groote *et al.*, 2017). Anselmsson *et al.* (2014) and Miškolci (2011) argue that quality is indeed a significant determinant of WTP a premium for improved foods. In a similar argument, Candace (2013) found that sensory attributes of composite porridge flour like attractive colour, thickness, taste and smell are more likely to be preferred by children and adults are more willing to buy it. De Groote *et al.* (2017) concluded that consumers in Senegal were more willing to pay for instant porridge flour with natural food additives like carrot and mango extracts compared to porridge flour with only micronutrient additives. Candace (2013); Grebitus (2013); and Frash (2014) further noted that consumers are more willing to buy fortified or food products produced locally for traceability or with ingredients that are socially acceptable.

Another study in China, Yu *et al.* (2014) concluded that younger consumers and higher income earners were more willing to pay a premium for other improved products like organic food. In a study in Iran, Haghjou (2013) concluded that due to health concerns, consumers with young children or special diseases were more willing to pay for organic foods. Research further shows that concerns for attributes like freshness, taste and safety of food influenced consumers WTP for food products in Germany, Ghana and China (Grebitus, 2013; Liu *et al.*, 2013; Owusu and Anifori 2013; Wu *et al.*, 2015). Wu *et al.* (2015) concluded that age, income level and education influence willingness to pay for other quality and safe food items. This shows some similarities in WTP for nutritious porridge flour and other food products as well as between developed and developing countries. However, Haghjou (2013) and De Groote *et al.* (2017) argue that without providing additional details to potential consumers, for example on the nutrition benefit of the food products, there may be no difference in their WTP.

In attempt to reduce malnutrition among the BoP households in Kenya and Uganda, this study aims to assess consumer WTP for a more nutritious and safe multi-composite porridge flour which can be consumed not only as a complementary food for young children and lactating mothers but also as a complementary meal for all household members in the informal settlements of Nairobi, Kenya and Kampala, Uganda. Soft porridge is widely consumed in East Africa mostly as a complementary food for children and lactating mothers and also as a meal for resource poor consumers who cannot afford other foods due to resource unavailability.

Literature shows that past research on WTP for nutritious foods has mostly been conducted on fortified porridge flour or improved food products which mainly focused on one or two micronutrients. Furthermore, the studies did not segregate the consumer groups and most of them sampled rural consumers, agricultural households or general consumers across a country. More importantly, neither did the studies look into low income consumer groups or households living in urban areas. The Base of the Pyramid (BoP) consumers living in the urban informal settlement spend over 60% of their income on food, yet malnutrition and micronutrient deficiencies remain widespread among this population, pointing to the inadequacy of the foods they purchase and consume in terms of quality and quantity.

The main objective of this paper is to understand whether the BoP consumer in the informal settlements of urban cities in Kenya and Uganda are willing to pay a premium or a discount for safe and nutritious multi-composite porridge flour. Further the paper seeks to understand the effect of providing nutrition information to the BoP consumers on their willingness to pay for the flour. Finally, the study analyses other factors that influence WTP for the nutritious porridge flour including any cross-country differences between Kenya and Uganda.

Methodology

Rational consumers will generally agree to buy a product whose price is set such that the utility generated in the purchase is sufficient (Chelang'a *et al*., 2013). Many methods can be applied to evaluate the impact of commercial products such as food items on consumers' valuation. Despite its extensive application in the valuation of nonmarket goods, the Contingent Valuation Method (CVM) has been recently used to value food safety and design agricultural food marketing (Brugarolas *et al.*, 2009 and Anabela *et al*., 2013). However, experimental auctions are becoming an important alternative to CVM as they overcome the hypothetical nature of the CVM by mimicking closely the choice process and the market in considering a real product and a real exchange of money (Brugarolas *et al*., 2009; Poole *et al.,* 2007; De Groote *et al.*, 2011).

Under experimental auctions, second price sealed bid auction, which is also known as the Vickrey auction (Vickrey, 1961), and the Becker-DeGroot-Marschak (BDM) mechanism (Becker *et al*., 1964) are popularly applied. In the second price Vickrey auction participants are asked to submit a bid (corresponding to the maximum willingness to pay) for a good. The

participant who wins the auction can purchase the good at the price stated by the second highest bid among the bidders in the auction. While in BDM, the participants are asked to submit a bid that is compared to a selling price randomly drawn from a distribution of possible prices defined by the researcher/marketer. If the submitted bid exceeds (or equals) the selling price, the purchase occurs at the sale price (Skuza *et al*., 2015 and Becker *et al*., 1964).

The two experimental approaches are incentive compatible, meaning that they provide participants with the incentive to truthfully undertake the bidding and reveal their true WTP (Lusk, Feldkamp, and Schroeder, 2004). Additionally, in BDM, the participants make independent and individual decisions hence most preferred by many researchers (Anabela *et al*., 2013). BDM mechanism does not necessitate gathering respondents together which is costly and time consuming. For this study therefore, the BDM mechanism was used to elicit the level of willingness to pay for improved multi-composite porridge flour among BoP consumers in Kenya and Uganda.

The WTP Experiment

Data collection for this study was conducted in the informal settlements of Kampala, Uganda and Nairobi, Kenya. Kampala and Nairobi were selected as they are the most urbanized cities in the two countries with an estimated population of 55-60% residing in slum areas (UN-HABITANT, 2007). Four urban Base of the Pyramid (BoP) sites with lowest poverty levels were selected in each of the two cities based on the national statistics (KNBS, 2015; UBOS & ILRI, 2004) and information from the administrative offices. In Nairobi Kenya, Kibera, Mathare, Kawangware, and Mukuru-kwa-Njenga were selected while Bwaise 11, Kamwokya 11, Kawaala 11, and Kawempe 11 were selected in Kampala Uganda.

Experiments on willingness to pay for safe and nutritious porridge flour were conducted using the BDM mechanism. The person responsible for decision making on porridge flour to be purchased for household consumption, who in most cases was either the household head or the spouse, was identified as the experiment respondent. The BDM method established by Becker *et al*. (1964), allows bidding by individuals, so it was possible to conduct this experiment with each

respondent at their household. Participants bid against a number from a random distribution mimicking an auction. The random number represents the market price of the product so that respondents whose bids exceed or are equal to the randomly drawn price win the auction and purchase the product at the random price. If the bid is less than the drawn price the participant does not get a chance to buy the product. On the one hand, the BDM mechanism discourages the tendency to overbid, because by bidding more than their WTP, participants risk paying more than the product is worth to them. On the other hand, they risk losing a valued product, if they bid lower than their WTP. Thus, the method allows participants in the bid to reveal their true WTP for the product.

According to Skuza *et al*. (2015**),** BDM has advantages over alternative types of auction mechanisms for application in the field. First, the procedure is relatively easy to implement in a point-of-purchase setting without creating an artificial choice environment, which should increase external validity of estimates. Second, participants do not bid against each other; rather, the bidding outcome and binding price are determined by drawing from a random distribution. Since participants do not bid against each other, it is possible to allow one or several participants in the experiment at a time, while preventing participants' bids from becoming affiliated (Skuza *et al*., 2015). This is a particularly attractive feature in the field where researchers have limited ability to control the flow of traffic in the experiment area. Lastly, the procedure maintains the theoretic incentive compatibility of other auction mechanisms (Lusk and Hudson, 2004). Despite the fact that this method is quite convenient in the field, it is said to generate less accurate results in induced value experiments than similar mechanisms like the Vickrey and n^{th} price auctions (Noussair *et al*., 2004; Lusk and Rousu, 2006; and Skuza *et al*., 2015). In our study, auction participants were randomly selected for the interviews following a systematic random sampling procedure. We believe this approach lowered the level of sample selection bias.

To conduct the WTP experiment, the following procedure was followed: Participants were informed that they were required to show how they value different types of porridge flour that would be presented to them. Then the BDM mechanism was explained and a test round was organized with cupcakes to familiarize participants with the mechanism and ensure that they fully understood it before conducting the actual bidding with porridge flour. Participants were given KES 30 ($US 0.30) and UGX 1,300 ($US 0.38) for the experiments in Kenya and Uganda

respectively, to enable them purchase the cupcakes if they win the bid. Afterwards, they were asked to make a bid for the two different types of cupcakes presented to them. They were then requested to randomly select a number which identified the binding round. Next, they were asked, to draw a number from a basket of numbers generated with a random distribution and, if the bid was greater than or equal to the number, the participant won the auction and bought the cupcake at the random price. Otherwise, they lost the bid. Respondents were given an opportunity to ask questions after the test round to ensure that they fully understood the bidding process.

Once the test round was completed, each participant was given KES 150 ($US 1.49) in Kenya and UGX 5,000 ($US 1.47) in Uganda and requested to make a bid for two porridge flour varieties presented to them. In both countries, half kilogram of conventional and improved porridge flours were packed in clear plastic bags and the composition in each flour indicated. In Kenya, the conventional flour was composed of maize and millet flour in half proportions while the improved flour composed of maize, beans, bananas, orange-fleshed pumpkin, carrots, and amaranth leaves. In Uganda, two conventional flours were prepared: maize only and millet only, so that the respondent selected the flour they mostly consume in their household which was then used as the conventional flour for the experiment. The improved flour in Uganda composed of maize, soybean, amaranth grain, beans, and moringa leaves.

Half of the respondents in each country were provided with information on the nutrition benefits of the improved flour based on the flour composition. This information was written down and translated to local language (Swahili in Kenya and Luganda in Uganda) to ensure that every enumerator read out same information to the selected respondents. Respondents who received this information were randomly selected by the researcher at the time of experiment, prior to participating in the BDM procedure, by alternating between consecutive respondents. In total 310 participants received nutrition information of improved porridge flour (151 from Kenya and 159 from Uganda), while 294 did not receive the information (152 from Kenya and 142 from Uganda).

After making the bids, participants were asked to randomly select a number which identified the bidding round. Afterwards, they were requested to draw a number from a random distribution which represented the market price of the flour. If the bid was greater than or equal to the

random number, the participant won the auction and bought the identified flour at the random price.

Empirical model

Since participants in the experiment were not allowed to state negative amounts, the WTP data are left-censored (censored from below) (Lusk and Shogren 2007). As such, any econometric procedure used to estimate an equation using WTP variable must take this characteristic of the data into account; failure to do so could result in biased estimates (Amemiya 1973). The Tobit model Tobin (1958) can be used when left-censored data are encountered. This method explains the relationship between a non-negative latent dependent variable and one or more independent variables. Unlike ordinary least squares, it takes explicit account of the limited nature of the dependent variable, yielding unbiased parameter estimates.

Thus, a latent variable y_i^* representing subject i's bid made for porridge flour (conventional or improved) is used in the model. Censoring occurred whereby y_i^* is observed for all values since all participants were asked to make bids. No negative price would be stated in this case. Hence, these latent variables are related to the observed offers, y_i by:

$$y_i = \begin{cases} 0 \\ y_i^* = x\beta + \varepsilon_i \\ \infty \end{cases} \qquad \text{Eqn (1)}$$

The dependent variable y_i are the bids made with regard to improved porridge flour in Kenya and Uganda and the standardized combined figure for the two countries for comparison reasons. The variable x is a vector of independent variables while β is a vector of estimable parameters and ε_i is a normally and independently distributed error term with mean of 0 and constant variance. Five groups of explanatory variables were used as control variables to explain factors that determine whether BoP consumers in the informal settlements of Uganda and Nairobi are willing to pay for safe and nutritious porridge flour. These were socio-demographic variables, nutritional information, porridge variety, locational variables, and the time of day when the interview was conducted. The demographic characteristics used include: gender, age and education level of the household head/breadwinner. Household head characteristics are important

as they capture the level of awareness and considerations when making the purchase. Presence of children above six months but below five years (aged 6 to 59 months) in the household was also included as a control variable. Households with young children are more likely to be more health conscious and therefore may be more willing to pay for the improved flour than the households without young children. This however may also be influenced by the level of nutrition information parents of the children/caretaker has, and also their level of education. Income of the household head was used as a proxy for economic status of the household. Economic status of the household may be an important factor determining consumer WTP for more nutritious foods as these foods are often more expensive than the conventional ones. More wealthy households may have a higher purchasing power than the less wealthy.

To determine the impact of nutritional information on the willingness to pay for improved porridge flour, half of the respondents in both countries were randomly selected and informed on the nutritional benefits of the flour before bidding. The nutrition information was only given about the improved flour (the safe and nutritious multi-composite flour), and not the conventional flour. This variable was included in the analysis. Nutrition knowledge is often positively associated with nutrition status of the consumers (Debela *et al*, 2017). We therefore hypothesise that provision of nutrition information is likely to increase the WTP for the improved flour.

The locational variables used include division of residence of the respondent and the country of residence. These are used to control for location or country specific characteristics. In the analysis we also control for the time of the day when the interview was conducted: morning, afternoon or evening. This was included as it may influence the person's willingness to pay especially when the interview is conducted around the time when porridge is occasionally served. A previous study on consumers' WTP for yellow and fortified maize meal in Kenya showed that that time of day when an experiment is conducted influences bidding (Morawetz *et al.*, 2011).

To conduct the experiment, four types of porridge flour were used in the: maize only, millet only, maize and millet mixture, and multi-composite flour. Maize only and millet only were used as the conventional flours in Uganda. In Kenya, porridge flour is mostly composed of a mixture

of maize and millet. Therefore, this was taken as the conventional flour in Kenya. The improved flour was a safe and nutritious multi-composite flour. In Uganda, most porridge flour consumers consumed porridge made of either maize alone or millet alone. The study respondents were distributed between those who consume maize alone and millet alone flour. To mimic reality in porridge consumption, the two porridge varieties were taken as the conventional flours, so that each household was first asked what type of porridge they consume, and then this would determine whether the experiment would be conducted with maize or millet flour as the conventional flour. The improved flour was the safe and nutritious multi-composite flour.

Results and discussion

Descriptive results

Descriptive statistics of variables used as controls in the regression analysis are presented in Table 1. From the sample study, household heads in Kenya are slightly younger than those in Uganda with a mean age of 37 and 40 years respectively, and the difference is statistically significant at 1 percent. In addition, majority of the household heads in both countries are male, and the percentage is significantly higher in Kenya (77%) than in Uganda (62%). Household heads often play a significant role in household decision making, for example in relation to use of household income and food purchase. In their study on the role of gender on household nutrition in Kenya, Chege *et al.* (2015) found that the gender of household head had a significant influence on household nutrition. The level of education of household head in the two countries differ as well. The Kenyan heads have a higher level of education with an average of 11 years of schooling compared to 9 years in Uganda, and the difference is statistically significant.

As can be seen from Table 1, few households in both countries have children above 6 months but below five years (between 6 and 59 months). In Kenya, this percentage is higher (43%) than Uganda (28%), and the difference is significant. This could be because Kenya hosts bigger and more densely populated informal settlements compared to Uganda. Informal settlements are said to show a high birth rate among adolescents and poor mothers who have less access to family planning skills and alternatives compared to the middle income and high income dwellers of urban areas. This concurs with Beguy *et al.* (2013) who confirmed a high birth rate among adolescents in Nairobi's informal settlements adding to a generally higher number of children in

sub-Saharan Africa compared to the rest of the world. However, this shows that demand and consumption of porridge which is mostly a preserve of lactating mothers and young children could be relatively higher in the urban informal settlements of Kenya than in Uganda.

Table 1: Summary statistics of household variables by country of study

		Kenya		Uganda	
Variable		Mean	Std. Dev	Mean	Std. Dev
Age of household head (years)		37.33	10.05	39.74**	13.04
Male household head (dummy)		76.57	42.42	61.79***	48.67
Education of household head (years)		10.54	3.19	8.68***	4.16
Household size (number of members)		4.65	1.89	4.83	2.14
Current porridge flour most consumed in the household					
- Single ingredient flour-millet (%)		26.40	44.15	14.62***	35.39
- Single ingredient flour-maize (%)		0.66	8.11	22.26***	41.67
- More than one ingredient flour (%)		72.94	44.50	63.12***	48.33
Proportion of HH with children between 6 & 59 months		0.43	0.50	0.28***	0.45
Monthly income from main occupation (US $)		171.68	146.73	112.22***	95.31
Proportion received nutrition information		0.50	0.50	0.53	0.50
Divisions of study (% of respondents)					
Kenya	Kibera	25.08	43.42		
	Embakasi	24.75	43.23		
	Mathare	25.08	43.42		
	Dagoreti	25.08	43.42		
Uganda	Kawempe			50.17	50.08
	Kampala Central			24.92	43.33
	Rubaga			24.92	43.33

Note: At the time of study, 1 US dollar was equivalent to KES 101 and UGX 3400; * Mean difference between Kenya and Uganda significant at 10% level, ** significant at 5% level, and *** significant at 1% level.

To elicit effect of nutrition information, 50% and 51% of the respondents in Kenya and Uganda respectively were provided with nutrition information. The survey used data from respondents living in divisions hosting some of the major urban informal settlements in the two countries.

Table 2 summarizes the willingness to pay levels between the two countries. Kenyan consumers were willing to pay 0.78 US dollars for 500 grams (gm) of improved flour and 0.48 US dollars for 500 grams of conventional flour. On the other hand Ugandan consumers were willing to pay 0.64 US dollars for improved flour compared to 0.39 US dollars for millet alone flour and 0.29 for maize alone flour. The average WTP for conventional flour (maize alone and millet alone)

was 0.33, which is much lower than the WTP for the improved flour (US dollar 0.64). Comparison in the WTP for improved flour between the two countries show that that Kenyan consumers were generally willing to pay more for the improved flour than the Ugandan consumers. This can be explained by the difference in the economic status of the two countries.

Table 2: Willingness to pay for 500 grams of different types of porridge flour by Kenyan and Ugandan consumers (in US dollars)

	KENYA		**UGANDA**	
Variable	Mean	Std. dev	Mean	Std. dev
Improved flour	0.78	0.30	0.64***	0.25
Maize and millet flour	0.48	0.18	-	
Millet alone	-		0.39	0.11
Maize alone	-		0.28	0.06
Conventional flour	0.48	0.18	0.33***	0.10

Notes: Improved flour is the safe and nutritious multi-composite flour; Conventional flour includes maize and/or millet porridge flour. In Kenya, this is equivalent to maize and millet flour as only one conventional flour was used, whereas in Uganda, it is the mean of WTP for maize alone and millet alone flours; At the time of study, 1 US dollar was equivalent to KES 101 and UGX 3400; *** Mean difference between WTP in Kenya and Uganda significant at 1% level.

In Table 3, we conduct further analysis to understand whether consumers in the two countries are willing to pay a premium or discount, and in what quartile majority of the consumers fall under. As can be seen from Table 3, on average consumers in both countries are willing to pay a premium for the improve porridge flour compared to the conventional flour. In Kenya, 94% of consumers were willing to pay a premium for improved porridge flour compared to the conventional flour, while only 3 % were willing to pay a discount, and a similar proportion (2.6%) were willing to pay the exact price as the conventional porridge flour. In Uganda 94% were willing to pay a premium for the porridge flour while 2.99% were willing to pay a discount, 2.66% were willing to pay the exact price for the porridge flour.

Additionally, 80.86% of Kenyan consumers were willing to pay 25% more and 57.43% were willing to pay 50% more for the improved flour than the price of the conventional flour, In Uganda, 85.71% of the consumers were willing to pay 25% more and 64.45% willing to pay 50% more than the price of the conventional flour. This indicates that in general more Ugandan consumers were willing to pay a greater premium for improved porridge flour than Kenyan

consumers. This may be explained by the importance of porridge in the Ugandan diet as compared to the Kenyan diet.

Table 3: Consumers' willingness to pay a premium or discount for the improved flour, by country

	KENYA			UGANDA		
		25%	50%		25%	50%
[a] Premium	94.06	80.86	57.43	94.35	85.71	64.45
[b] Discount	3.30			2.99		
[c] Same	2.64			2.66		

[a] Note: WTP for improved is > WTP for Conventional (maize and/or millet) porridge flour
[b] Note: WTP for improved is < WTP for Conventional (maize and/or millet) porridge flour
[c] Note: WTP for improved is = WTP for Conventional (maize and/or millet) porridge flour
At the time of study, 1 US dollar was equivalent to KES 101 and UGX 3400

Econometric model results

In this section we present results of the Tobit model regressions conducted to understand factors influencing willingness to pay for safe and nutritious porridge flour (improved porridge flour) by BoP consumers across the two countries of study. We present the overall results and further separate the analysis by country of study. In the analysis, we present short models (models 1 and 2) and long model (model 3) to understand how different variables influence the WTP for the improved flour. Variables were added progressively in models 1, 2, and 3. The overall regression model results are presented in Table 4.

Model 1 analyzes effect of nutrition information on WTP for improved flour by respondents in Kenya and Uganda. Overall, this variable has a positive and significant effect on WTP, implying that providing nutrition information to consumers on improved flour increases their WTP for that flour. This is plausible as providing nutrition information provides consumer with more information about the products. In the second model (Model 2), income of household head from main occupation is include in the model as a proxy for economic status of the household. Both income and nutrition information variables remain significant, implying that economic status is an important factor that determines whether consumers pay for the improved porridge flour or not. This is expected as households with higher incomes are expected to have a higher

purchasing power than those with less, and this would increase the probability of purchasing a more expensive commodity.

Table 4: Tobit results for determinants of willingness to pay for improved porridge flour: Overall model for Kenya and Uganda

	Model 1		**Model 2**		**Model 3**	
Variables	**Coefficient**	**Std. Err.**	**Coefficient**	**Std. Err.**	**Coefficient**	**Std. Err.**
Received nutrition information (dummy)	0.043*	(0.02)	0.05**	(0.02)	0.05**	(0.02)
Monthly income of HH head from main occupation ($)			0.27***	(0.08)	0.12	(0.09)
Male household head (dummy)					0.02	(0.02)
Age of the household head (Years)					0.004***	(0.001)
Education of household head (Years)					-0.004	(0.004)
Household size (number)					-0.004	(0.01)
Children aged 6 to 59 months					0.05**	(0.02)
Current porridge flour most consumed in the household [a]						
- Single ingredient flour (millet)					0.08*	(0.04)
- More than one ingredient flour					0.11***	(0.03)
Time of day[b]						
- Morning					0.03	(0.03)
- Evening					0.03	(0.03)
Country (Uganda)					-0.12***	(0.03)
Constant	0.67***	(0.02)	0.63 ***	(0.02)	0.58***	(0.10)
Sigma	0.28***	(0.01)	0.27***	(0.01)	0.26***	(0.01)
F statistics	3.57**		7.41***		6.29***	
Observations	572		572		572	

Note: Dependent variable is willingness to pay (in USD/Kg); Coefficients shown with robust standard errors in parentheses, ***, **, * is significant at 1%, 5% and 10% respectively; [a] Reference is single ingredient flour (maize); [b] Reference is afternoon; [c] Reference is Kenya;

In model 3, several other variables are included to analyze their possible effect on WTP for the improved flour. Provision of nutrition information still remains significant. Further, we find that

age of household head has a positive and significant effect on WTP for the improved flour, implying that households with older heads may be willing to pay more for the improved flour than those with younger heads. Further, we find that households with young children between 6 and 59 months are willing to pay more for the improved nutritious flour than those without young children. This is expected as those with small children are likely to be more conscious about nutrition of their children as more nutrients are required in child development and growth. This is in line with findings elsewhere, where Haghjou (2013) found that consumers with young children were more willing to pay for healthy and nutritious foods.

We also find that households that currently consume porridge made of millet alone or with more than one ingredient, are more willing to pay for the improved porridge flour than those who consume porridge flour made of maize alone. This could be because the former category of consumers already know the nutrition benefits of consuming nutritious porridge unlike those who mostly consume maize flour porridge alone. Maize flour porridge is less nutritious compared to millet and other porridge flours with more than one ingredients.

Finally, we find that respondents in Uganda are willing to pay less for the improved flour compared to the Kenyan respondents. This is in line with the descriptive findings in Table 2. The difference in WTP across the two countries could be explained by various factors. First is the difference in pricing of commodities between the two countries. Food products and commodities are usually cheaper in Uganda than in Kenya. This is due to the differences in the economic status of the two countries. Second, the improved products in the two countries have different ingredients. Some of these ingredients used in the Kenyan product may be more expensive than those used in the Uganda product. Finally, the level of nutrition knowledge of consumers' in the two countries may be different. There is likely to be a higher nutrition knowledge in Kenya than in Uganda.

Since findings from the descriptive and regression analysis show that there is likely to be differences in WTP for improved flour between the two countries, we conduct further analysis separately for each country to find out the specific factors that are likely to determine the WTP

for the improved flour. Results of the Kenya and Uganda models are presented in Table 5 and 6 respectively.

From the Kenya model (Table 5), we do not find any significant effect of nutrition information on WTP for improved flour. This could be explained by the fact that most Kenyan consumers, including those in the informal settlements, have some nutrition awareness, so that providing nutrition information about the porridge flour does not make any significant difference in their willingness to pay. Furthermore, most of the respondents in the informal settlement indicated that they consume porridge flour made of more than one ingredient, and therefore may already have some nutrition information on importance of consuming porridge flour with diversified ingredients.

Income of household head, a proxy for economic status of the household, turns out as an important determinant on WTP for the improved flour. The variable is significant both in the short model (Model 2) and the long model (model 3). Household head characteristics gender and education level) also influences WTP for the improved flour. Perhaps male heads are more resource endowed given the nature of the BoP households who are mostly resource constrained. More educated housheold heads are less likely to pay for the improved flour, possibly because they may be more knowledgeable on what other diversified foods to consume in their household. However, this is fascinating as the reverse would be expected. Compared to the results of De Groote et al. (2017) who studied the willingness to pay for instant fortified pearl millet in Senegal, every extra year of education, led to an increase in WTP by 6.5 FCFA.

As was the case for the overall model, the Kenyan households with young children are more willing to pay for the nutritious porridge flour than those without young children. Finally, we also find location differences in the WTP. Compared to the residents of Kibera, those residing in Embakasi and Dagoreti were willing to pay less for improved flour. Perhaps these latter households do not entirely depend on porridge for nutrient supply unlike those residing in Kibera who are extremely income deficient. They might be forced by circumstances to depend on porridge flour hence going an extra mile to foot the prices of the improved flour which is an integral source of the nutrients for the household members especially children.

Table 5: Tobit results for determinants of willingness to pay for improved porridge flour: Kenya model

Kenya	Model 1		Model 2		Model 3	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err
Received nutrition information (dummy)	3.6838	3.4959	2.5872	3.5552	2.718	3.427
Monthly income of HH head from main occupation ($)			0.1870*	0.1016	0.238**	0.117
Male household head (dummy)					6.800*	3.811
Age of the household head (Years)					0.269	0.221
Education of the household head (Years)					-1.571**	0.660
Number of children 6-59 months					9.572***	3.619
Current porridge flour most consumed in the household[a]						
- Single ingredient flour (millet)					16.09	14.47
- More than one ingredient flour					14.25	14.25
Time of day[b]						
Morning					-5.127	3.586
Evening					7.979	7.287
Division of study[c]						
Embakasi					-12.53**	5.399
Mathare					-1.707	5.694
Dagoretti					-15.26***	5.188
Constant	76.2566**	2.5193	73.4714***	3.1456	63.64***	18.23
sigma	30.3805***	1.1996	30.4532***	1.2243	28.68***	1.212
Observations	294	294	294	294	294	294

Note: Coefficients shown with robust standard errors ***, **, * is significant at 1%, 5% and 10% respectively,
[a] Reference is single ingredient flour (maize); [b] Reference is afternoon; [c] Reference is Kibera division;

Results of the Uganda model are presented in Table 6. Providing nutrition information comes out as an important determinant on WTP for the improved flour, both in the short models (models 1 and 2) and the long model (model 3). Age of the household head also affects the WTP for the improved flour. Finally, households that currently consume porridge made of more than one ingredient are more likely to pay for the improved flour compared to those who consume porridge made of maize flour only. Tis could be explained by the fact that these consumers already know

the nutrition benefits of consuming a multi-composite porridge and therefore they would be more willing to pay for the safe and nutritious porridge flour.

Table 6: Tobit results for determinants of willingness to pay for improved porridge flour: Uganda model

	Model 1		Model 2		Model 3	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Received nutrition information (dummy)	208.8848 *	98.5109	282.3576***	100.7748	270.0***	102.2
Monthly income from main occupation ($)			0.0318317	0.13975	-0.0658	0.158
Male household head (dummy)					-26.63	127.6
Age of the household head (Years)					11.83**	5.286
Education of the household head (Years)					9.236	15.18
Children under five years but over five months					51.89	99.98
Current porridge flour most consumed in the household [a]						
- Single ingredient flour (millet)					51.54	133.5
- More than one ingredient flour					424.6***	125.2
Time of day[b]						
Morning					68.55	168.1
Evening					-60.41	110.8
Division of study[c]						
Kampala central					36.10	112.9
Rubaga					178.2	126.9
Constant					1,256***	342.6
Sigma					802.8***	45.16
Observations					278	278

*Note: Coefficients shown with robust standard errors. ***, **, * is significant at 1%, 5% and 10% respectively,*
[a] Reference is single ingredient flour (maize); [b] Reference is afternoon; [c] Reference is Kawempe division

Conclusions and recommendations

Generally, consumers across the two countries of study were willing to pay a premium for the improved porridge flour compared to the conventional one. The Kenyan consumers did not seem

to prefer the porridge flour with maize as the main starch ingredient. But the Ugandan consumers were willing to spend although less for the maize-based porridge flour. On average however, majority of Kenyan consumers were willing to pay higher amounts than the Ugandan counterparts for the improved porridge flour. We associate this with the differences between consumers in the two countries in terms of nutrition awareness, the difference in composition of the improved flours used in the experiment, and the differences in the economic status of the two countries. All these could play a role in the differences in WTP for the products in the two countries.

Only three percent of consumers in both countries were willing to pay a discount. This implies that improved porridge could possibly fetch a premium when marketed within the two broad markets.

The study findings also reveal the importance of availing nutrition information of the flour ingredients. Overall, providing nutrition information had a positive and significance WTP for the improved flour. Consumers from Uganda who were informed about the nutritional content of the flour were also willing to pay a premium compared to those who did not receive any information. But the Kenyan counterparts did not seem to be driven by the information. Possibly because consumers in Kenya may be more informed on the nutrition benefits of various ingredients and therefore, providing nutrition information of the flour did not influence their WTP. These findings show that providing nutrition information is key to improving nutrition of consumers, especially those who are less informed. This could be an entry to reducing malnutrition in developing countries, especially among the base BoP consumers in the informal settlements.

Finally, to improve the adoption of the improved porridge flour, the following key drivers should be considered within the two country markets: provision of the information about the nutritional benefits of the flour perhaps through proper labeling and marketing. Market segmentation to target families with children under the age of five could help sell the product.

The study findings imply that the BoP consumers in the informal settlements are willing to pay for nutritious foods as long as long as they are well informed on the nutrition benefits of product composition, the product is accessible, and they have the purchasing power. This implies that

when such products are presented to the BoP consumers, the marketer should ensure the products are packaged and priced in a way that these consumers can afford to purchase them. Small packages with low prices may be more preferred than large packages of high prices considering their low purchasing power. In addition, nutrition information of food products should always be availed to consumers so that they are aware of how the product would benefit them.

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