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Can information drive demand for safer food?
The impact of general and specific food safety information on product choice

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Abstract

As an unobservable attribute, food safety is often under-provided by markets in low and middle-income countries where regulatory enforcement is weak. In these settings, stimulating consumer demand for safer food can potentially encourage market actors to invest in food safety. Previous work on the Kenyan maize flour market has found that some brands are relatively less contaminated with aflatoxin, a carcinogenic fungal byproduct, and also more expensive. In this study, we test the impact of information on demand for these safer maize flour brands among consumers in a mid-sized Kenyan city through a randomized controlled trial. Results show that informing consumers about which brands are safer increases their likelihood of consuming these brands, and their per-unit expenditures on maize flour, but only if the information is accompanied by a test of the aflatoxin status of the flour they currently consume.

Key words: Information, food safety, aflatoxin, consumer behavior, LMI

1. Introduction

Foodborne illness is a major health problem globally, responsible for a burden of disease on par with tuberculosis and higher than maternal mortality (WHO 2015). Middle-income countries bear a disproportionate share of this burden, as their food systems become more complex, and public capacity for enforcement of regulations lags behind (Jaffee et al. 2018). At low income levels, consumer demand for food safety is typically weak, resulting in a low prioritization of this issue by both the market and governments (Hoffmann, Moser, and Saak 2019; Jaffee et al. 2018). Stimulating consumer demand for safer food thus has the potential to catalyze action within the food industry and by policymakers.

In this paper, we study the impact of providing consumers in a mid-sized Kenyan city with information about the relative safety of brands within a product class – maize flour – on their subsequent purchase behavior. Unlike much of the previous literature on consumer demand for food safety, we measure this impact several weeks after the information is provided. This allows us to provide the first estimate of which we are aware of the medium-term effect of food safety information on individual consumer behavior.

Food safety is mostly an unobservable attribute that is not easily evaluated by a consumer either at the point of sale or after consumption. Food safety regulations exist to protect consumers, but in low and middle-income countries, firms' capacity to comply with these regulations, as well as public capacity to enforce them, is generally weak. In such settings, firms that differentiate their product based on quality face the need to protect their brand equity against potential food safety incidents or government-issued recalls (Hoffmann and Moser 2017). This results in product heterogeneity in terms of food safety, with some firms competing on product characteristics (thus selling higher quality, safer products at a higher price) and others competing on price, selling lower quality and relatively unsafe products at a lower price.

We conducted an experiment among consumers in a town in Eastern Kenya. All the households in the study were given general information on aflatoxin contamination and the effects of consuming contaminated foods. Some households were given additional information on two brands that have been found to be more likely to meet the Kenyan aflatoxin regulation limit (Hoffmann and Moser 2017). A subset of households that received this additional information also received test results showing the aflatoxin status of the flour that was being consumed at the time of visit.

Results show positive and significant effects of information on safer brands on the accuracy of people's beliefs about the existence of safer brands, their likelihood of consuming them and on the price of brand of flour being consumed at follow-up. Households that received information on the safer brands had more accurate beliefs by about 8 percentage points above households that received general information on aflatoxins. In addition, these households were 9 percentage points more likely to consume any of the mentioned safer brands and more likely to be consuming an expensive brand. The results on the likelihood of consuming any of the mentioned safer brand and on the price outcome are driven by the effect on the group that received both information on the safer brands and a test result of aflatoxin status of the flour being consumed. The effect of information without the test result for these outcomes is not statistically different from zero. The effect of information is highest for the households whose maize flour was found to contain aflatoxin levels above the Kenyan regulatory limit.

In the next section, we describe the food safety hazard on which the study is based, consumer response to this hazard, and review the literature on the impact of information on heath behavior. We then and provide a brief overview of the Kenyan maize market in Section 3. Section 4 describes the study design, and the empirical strategy and results are described in Sections 5 and 6. Section 7 concludes.

2. Aflatoxin, consumer response, and the effect of information on behavior change

The food safety hazard on which we focus in this paper is aflatoxin. Aflatoxins are a group of mycotoxins that contaminate agricultural produce, mostly maize, ground nuts and tree nuts. Consumption of foods with very high levels of aflatoxin can result in a sometimes fatal condition known as aflatoxicosis, multiple outbreaks of which have occurred in the study region (Lewis et al. 2005). Chronic exposure to aflatoxin in utero and during early childhood has been associated with low birth weight (Shuaib et al. 2010) and childhood stunting (Morris et al. 2002; Turner et al. 2007; Shirima et al. 2015; Hoffmann et al., 2018). In addition, chronic exposure is known to cause liver cancer (Wu et al. 2013) and is suspected of inhibiting immune system function (Wild and Gong 2009).

Like many food safety hazards, aflatoxin contamination cannot be detected by tasting or observing, but only through a specialized test. The Kenyan Government has set a regulatory limit for aflatoxin of 10 ppb in food for human consumption. A study based on data collected in 2013 found that 26% of branded maize flour samples collected in Eastern Kenya had aflatoxin levels higher than the 10 ppb limit (Hoffmann and Moser 2017). The proportion of samples testing above the limit varied by brand, and was significantly associated with the mean price of brand, with the lowest-priced brand 25 percentage points more likely to contain aflatoxin in excess of the regulatory limit than the highest priced brand in the sample. In a separate study for which data was collected in the same region in 2010, 37% of samples of flour from local hammer mills (to which consumers typically bring maize grain they have grown themselves or purchased) were found to contain levels above the regulatory limit (Mutiga et al. 2014).

Aflatoxin contamination can occur during crop development or during storage if the crop is stored at a moisture level that allows fungal growth. Once present, aflatoxin is both difficult and costly to destroy. Technologies to reduce contamination during production include the application of biocontrol products during cultivation (Atehnkeng et al. 2014; Bandyopadhyay and Cotty 2015) and post-harvest practices such as thorough drying on an impermeable barrier, and sorting prior to storage (Turner et al. 2005; Pretari, Hoffmann, and Tian 2019). All of these practices have cost implications, and adoption by producers remains low (Hoffmann, Kariuki, et al. 2018; Pretari et al. 2019). Higher demand for aflatoxin safety among consumers has the potential to change this.

Previous work in Kenya indicates that consumers may be willing to pay for aflatoxin-safe foods. Two framed field experiments show a high willingness to pay for safe maize among rural consumers in disparate regions of the country (De Groote et al. 2016; Hoffmann and Gatobu 2014). However, in both of these studies, the context surrounding consumers' choices were highly artificial: cash and information about food safety were provided immediately prior to the elicitation of bids for aflatoxin-safe and unlabeled maize. The current study examines the impact of food safety information on consumer choice in a natural setting.

A closely related study examined the role of price discount and marketing efforts in creating demand for a certified and labelled maize flour brand (Hoffmann, Moser, and Herrman 2017). That study found that a marketing campaign combined with a temporary discount resulted in elevated sales of the target brand for several weeks after the discount had ended, but that the effect vanished within two months. The effect of the marketing campaign alone was much weaker and shorter-lived. The present study tests the impact of a potentially more credible information intervention, which provided consumers with results from previous research and was not associated with any firm's marketing efforts. Further, we test the impact of consumer-specific information: the results of a rapid aflatoxin test conducted on maize flour currently being consumed by the household. Finally, our design allows us to evaluate the effect of information on individual consumer behavior, rather than shop-level demand as in the study by Hoffmann, Moser, and Herrman 2018.

Our study adds to the ongoing research on the role of information in stimulating demand for safer foods and for preventive health in general. This line of research assumes that consumers are Bayesian in the sense that they update their beliefs as new information becomes available. A change in beliefs is then hypothesized to result in change in behavior (Chern, Edna, and Yen 1995). This literature has yielded mixed findings, with more tailored information, such as test results typically more effective than general information. [1]. For example, providing information on the fecal contamination of household drinking water significantly increased point of use water treatment in India (Jalan and Somanathan 2004), and in Bangladesh providing information on the arsenic contamination status of nearby water sources increased the likelihood that households used an uncontaminated source (Madajewicz et al. 2007).

[1] See a review on information experiments in low income countries aimed at examining the role of information on adoption of preventive health products in (Dupas and Miguel 2016).

However, people may fail to change their behavior in the face of new information for various reasons, including liquidity constraints (Kremer and Glennerster 2011), incorrect mental models such as superstitions, present bias, procrastination and limited attention (Kremer, Rao, and Schilbach 2019). In Kenya, consumer awareness of aflatoxin is relatively high (72 % of consumers in a nearby study area that included parts of Eastern and Central Kenya indicated that they had heard of aflatoxin, (Hoffmann et al. 2017)). Incorrect mental models are thus unlikely to be a major barrier in this context. Present bias can lead people to procrastinate when they compare immediate costs to (which may be monetary costs or psychological and hassle costs) benefits realized in the future. A change from one brand to another is unlikely to involve significant psychological or hassle costs, as people will purchase and consume flour in any case. However, there is a monetary cost to choosing a safer brand since these tend to be relatively expensive. Thus, a liquidity constrained (and more so present biased) consumer may not change to a safer brand despite having information on its existence.

Our study contributes to the existing literature on the role of information in stimulating behavior change in two ways. First, most previous studies do not measure prior beliefs and impacts on behavior are simply assumed to result from an update of beliefs in the expected direction (Kremer et al. 2019). In our study, we measure beliefs regarding heterogeneity across brands in terms of aflatoxin contamination, as well as other indicators of pre-intervention knowledge, and test for heterogeneous treatment effects on this dimension.

Second, we experimentally vary the type of information provided to test whether tailored information (in the form of an aflatoxin test of the flour currently being consumed) is more effective than providing information on safer brands alone. Test results provide a rational (Bayesian) consumer with information about his or her current level of risk exposure, thus affecting the expected benefit associated with a potential behavior change. Tailored information may also increase the salience of food safety, overcoming potential attention constraints.

3. The Kenyan maize flour market

Maize is the primary staple food in Kenya, accounting for 42% of dietary energy intake (Kilimo Trust 2017). Maize in Kenya is consumed as either grain or flour. Grain may be produced by consumers or purchased from the informal market and is especially popular among rural consumers. Flour is of two types: more refined sifted flour processed in larger-scale roller mills, and less refined or whole grain flour processed in micro-scale hammer mills.

There are over 100 large-scale roller millers in Kenya; relatively few of these dominate the Nairobi market, and as of 2011 four firms accounted for 80% of sifted flour sales (Kirimi et al. 2011). However, market concentration tends to be lower in rural areas, where regional millers offering maize at lower price points have significant market share. Prices vary widely across brands: in 2013 the difference between the highest and the lowest priced brand in various towns of Central and Eastern Kenya was 27 KES per kg, slightly more than half the price of the lowest priced brand (Hoffmann and Moser 2017) .

Hammer mills ("posho mills") produce two types of flour; semi refined flour (by dehulling) and whole grain (non-refined) flour. Most of these mills only provide the milling service and therefore do not purchase any grain. Consumers take their own produced maize or maize purchased as grain from the informal grain market for the milling service. This flour is unbranded, and the source of maize may not be easy to trace, except for the case of own produced maize. As a result, this type of flour is much cheaper than the sifted flour and is popular among rural consumers and the urban poor (Muyanga et al. 2005).

Fast and easy to use aflatoxin test kits are available in Kenya. Millers in Kenya indicate that rapid binary tests cost them around 11-16 USD per 10-28 metric tons of maize (Hoffmann et al. 2017). This cost is reasonable given the high volumes transacted. The cost of tests is however relatively high for individual consumers due to the low volume and value of flour bought per transaction. Nevertheless, such rapid test kits offer potential opportunities for public health officials to conduct rapid onsite tests on samples of flour available in shops or flour being consumed by consumers (especially during aflatoxin outbreaks).

4. Study design

4.1. Population and sample

This study was carried out among the residents of Meru town, a town located in the Eastern region of Kenya. This region is a hotspot for aflatoxin contamination. A list of all the locations, sub-locations and villages that have an urban population was generated with the help of an officer from Kenya National Bureau of Statistics, Meru county. Four locations[2], with a total of 10 sub locations and 64 villages, were identified. A total of 1000 households were randomly selected from these locations to form our sample.

4.2. Experimental design

All the households in our sample were visited in their homes in August/ September 2018. Twenty-one households declined to participate in our study. The remaining 979 households were randomly assigned to one of the experimental treatments shown in Figure 1.

[2] A Location is an administrative unit in Kenya that is third level subdivision, below counties and sub counties. It coincides with an electoral ward in the new constitution. A location is subdivided into sublocations. It has on average 6000 households.

All the households received general information on aflatoxin contamination including the effects of consuming contaminated foods. Households that received the general information alone constitute the comparison group. In addition to this general information, households assigned to the safer brands information treatment arm (T) were told about two brands previously found to be relatively unlikely to exceed the limit for allowable aflatoxin contamination, and about the negative correlation between price and contamination level. Among those assigned to the safer brands information treatment, half were further assigned to be offered aflatoxin testing of any maize flour they had in their home (T2), while half received no further information (T1). A qualitative test was used to test for aflatoxin. The test takes 10-15 minutes, and the results can easily be read visually. The respondent was invited to stay as the test was conducted. The test result and the interpretation were shared with the respondents. The information scripts used for each of the treatment groups is added at the appendix, Appendix 1.

The 979 study households were randomly assigned to each of the treatment groups as follows: 166 to the comparison group, 168 to T1 (safer brands information) and 645 to T2 (safer brands plus testing information). In some of the analysis presented below, we further divide T2 into two groups based on the aflatoxin test result; those whose flour had levels higher than 10 ppb (positive test result group or T2P) and those whose flour had levels lower than 10 ppb (negative test result group of T2N).

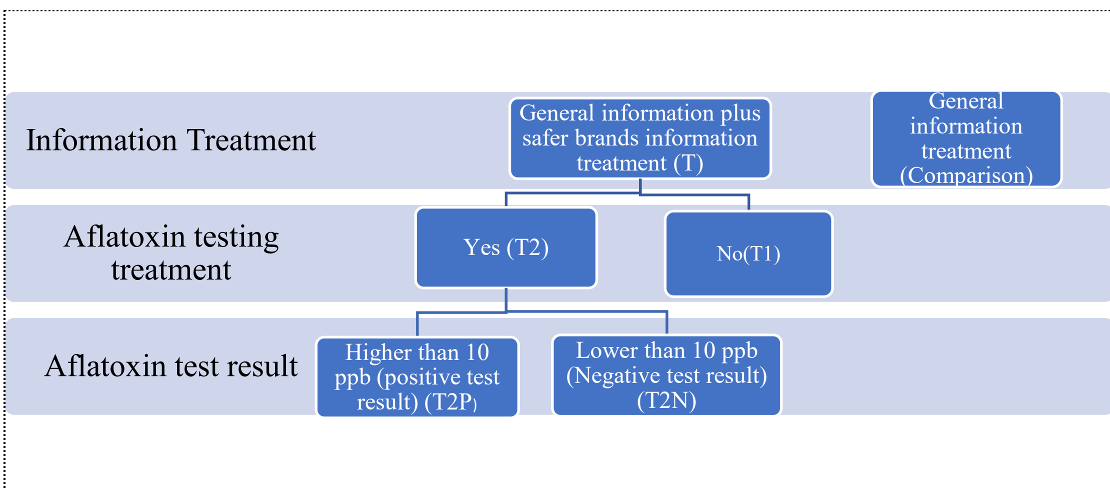

Figure 1: Experimental design

4.3. Data

Baseline data collection was conducted in August/ September 2018, during the same visit when information was provided. Data collected at baseline was used to conduct the balance tests described in Section 3.4.

Follow up data collection was conducted in November 2018, 9-10 weeks after the baseline data collection and information treatment. All the households assigned to the comparison and safer brands information (T1) treatments were interviewed at follow-up. However, only a subset of households in the safer brands plus testing group (T2) was interviewed during the follow up. This included all the households whose flour had tested positive for aflatoxin contamination (61 households) and a randomly selected subsample of the households whose flour had tested negative for aflatoxin contamination (237 households). The latter accounted for 44% of all the households that received a negative test result. The rest of the households were not followed due to budgetary constraints and because adding households with a negative test result did not offer significant benefits in terms of power. Households whose flour was not tested were not followed up. The failure to follow up these households constitutes a challenge to the interpretation of our results, which we address in the analysis through the estimation of Lee bounds (Lee 2009) to account for non-random attrition.

Data collected during the follow up was used to generate the outcome variables. We have three main outcome variables, namely: an index describing the respondent's belief in the existence of safer maize flour brands, consumption of a safer brand at follow up and the price of the flour being consumed at follow up. The beliefs index is constructed as the summation of response indicators (1=strongly agree, 2=agree, 3=neither agree nor disagree/not sure, 4=disagree 5=strongly disagree) to the following three statements: (a) any packaged maize flour available at the shop must be safe (b) some brands of packaged flour have higher levels of aflatoxin contamination than others and (c) more expensive brands have a lower chance of being contaminated with aflatoxin compared to the cheaper brands. The answers are assigned values ranging from 0 to 4, with the most accurate answer corresponding to a value of 4 and the least accurate a value of 0. The most accurate answer to statement (a) is strongly disagree and is therefore assigned a value of 4, while the most accurate answer for the last two statements is strongly agree hence assigned a value of 4. The index therefore ranges from 0 to 12, where 12 indicates most accurate beliefs and 0 indicates least accurate beliefs. Consumption of a safer brand by the household is measured as a dummy variable indicating whether the flour that was being consumed by the household at follow-up[3] is one of the brands described as relatively safe in the information script. The third outcome is the price variable, calculated as the median price per kilogram of the brand being consumed by the household at follow-up. The median price was calculated from the price reported by the respondents for the brand being consumed.

4.4. Descriptive statistics and balance checks

In this section, we briefly describe key features of the sample and test for balance across the treatment groups using the data collected at baseline. First, we present some descriptive statistics

[3] If there was no flour in the house, as was the case for 25% of households at follow-up, respondents were asked to describe the type of flour they had purchased most recently.

on the types of flour consumed at baseline, their prices, and the proportion of samples of each type found to contain aflatoxin levels above the regulatory limit of 10 ppb.

Column 1 of Table 1 shows that most households (80%) were consuming sifted flour, including the two brands identified in the information treatment as relatively safe. Only 9 percent were consuming either of the two safer brands (6% and 3 %). Nineteen percent were consuming maize they took themselves to a small-scale hammer ("posho") mill. These households either used maize from their own production (15 %) or purchased whole maize grains in the market (4%). Column 2 shows the average price per kg of each flour type. One of the safer brands was the most expensive at 72 KES. The price of the other brand was 53 KES per kg, only one shilling above the price of the other sifted brands. Flour milled by consumers at a local hammer (posho) mill from maize grains purchased in bulk was far less expensive at 35 KES per kg. We do not report prices for own-produced posho-milled since we do not have data on maize sales prices or production costs.

Column 3 of Table 1 shows the proportion of samples of each type of flour tested through the study that were found to contain aflatoxin above the 10 ppb Kenyan regulatory limit. None of the samples of either safer brand had aflatoxin levels higher than 10 ppb. Only 6 % of other packaged brands had levels higher than 10 ppb. The posho mill flour from own produced maize and from maize purchased as grain had the highest proportion of samples with aflatoxin levels higher than 10 ppb (30% and 28%, respectively). This reflects the fact that the study was conducted in one of the highest aflatoxin risk counties in Kenya, whereas much of the commercially milled maize is grown elsewhere in the country due to relatively low local production volumes.

Table 1: Types of flour consumed at baseline, their prices and proportions of each type with aflatoxin levels higher than 10 ppb

	(1)		(2)		(3)
Type of flour	Proportion of households consuming this type	N (2)	Price per kg	Number of samples tested	Proportion with aflatoxin level higher than 10 ppb
Safer brand 1	0.06	58	53	27	0.00
Safer brand 2	0.03	29	72	17	0.00
Other packaged brands	0.74	729	52	445	0.06
Flour from own produced maize	0.15	144	n/a[1]	80	0.30
Flour from maize purchased from the market	0.04	34	35	32	0.28
Overall	1.00	979		601	0.10

Note 1: The price of own produced maize is omitted since we do not have sufficient data to calculate the value of own produced maize

Next, we present descriptive statistics for the sample, and test for balance across the treatment groups using data collected at baseline. Results are shown in Table 2a. Column 1 presents the means of the whole sample. Treatment group means are presented in columns 2, 3, and 5, and 6 and the p-values of differences across each pair of groups compared in the analysis are shown in columns 4, 7, 8, and 9. Definition of each of the variables in table 2a is presented in the appendix as Appendix 2.

The first variable presents respondents' beliefs about the existence of safer brands at baseline. The index ranges from 0 to 4, with 4 indicating the most accurate beliefs[4]. Row 1 of Table 2 shows an average value of 2.51 for the whole sample. The average age of the respondents in our sample was 43 years, with an average of 10 years of formal education. A household head was interviewed in about half of the cases. Respondents had low levels of general trust (an average of 0.31 out of a maximum of 2) and institutional trust (an average of 1.74 out of a maximum of 4). In addition, we add a dummy for households that were randomly selected for additional in-depth interviews to assess the respondent's perception of the attributes of flour they normally consume. Previous work has shown that baseline interviews may influence people's later behavior hence biasing the effects of an intervention (Zwane et al. 2014). While everyone was interviewed at baseline and we cannot control for this, a randomly selected 6% of respondents were subjected to additional in-depth interviews that may potentially increase the attention of these respondents to food safety issues. We therefore control for this in our estimations.

Generally, randomization worked relatively well with only two of the 52 tests (4 comparisons for each of 13 variables) showing a difference significant below $p<0.05$, and three additional differences significant at $p<0.1$.

[4] The baseline beliefs variable was constructed from 2 questions and using a 3 point Likert scale; 1=agree 2=Neither agree or disagree 3=disagree (hence a range of 0-4 for the two questions) while the beliefs at follow-up was constructed using 3 questions on a five point Likert scale

Table 2: Pre-intervention household and individual characteristics from the baseline survey and balance tests across treatment groups

	(1)		(2)		(3)		(4)	(5)		(6)		(7)	(8)	(9)
	All		Comparison group		Safer brands information treatment (T)		(3-2)	Safer brands information only treatment (T1)		Safe brands plus testing treatment (T2)		(5-2)	(6-2)	(6-5)
	Mean	SD	Mean	SD	Mean	SD	P	Mean	SD	Mean	SD	P	P	P
Baseline beliefs	2.51	1.13	2.46	1.16	2.51	1.12	0.638	2.38	1.11	2.55	1.13	0.552	0.448	0.117
Consumption of a safer brand at baseline	0.09	0.29	0.10	0.30	0.09	0.29	0.851	0.09	0.28	0.09	0.29	0.760	0.892	0.799
Price per KG at baseline (KES)	44.66	17.55	44.39	16.69	44.72	17.73	0.840	45.91	16.22	44.42	18.08	0.451	0.987	0.349
Consumption of flour from own produced maize	0.15	0.36	0.15	0.36	0.15	0.36	0.969	0.15	0.35	0.15	0.36	0.899	0.931	0.801
Age of the respondent (complete years)	42.51	15.55	43.46	16.10	42.33	15.44	0.456	41.32	15.41	42.58	15.46	0.267	0.568	0.395
Education level of the respondent (complete years)	9.88	3.96	9.67	3.92	9.92	3.97	0.503	9.70	3.87	9.97	4.00	0.943	0.426	0.469
Respondent is household head	0.50	0.50	0.58	0.49	0.49	0.50	0.041	0.42	0.49	0.50	0.50	0.006	0.099	0.066
Aflatoxin knowledge index	0.02	0.86	0.05	0.89	0.01	0.86	0.668	-0.03	0.88	0.02	0.85	0.484	0.759	0.555
Wealth index	0.07	0.97	0.10	0.95	0.06	0.98	0.668	-0.07	0.89	0.09	1.00	0.134	0.943	0.064
General trust level	0.31	0.68	0.27	0.65	0.32	0.68	0.392	0.31	0.69	0.32	0.68	0.553	0.390	0.926
Institutional trust level	1.74	1.52	1.81	1.49	1.73	1.53	0.582	1.77	1.54	1.72	1.53	0.811	0.549	0.771
Participated in the additional interview	0.06	0.24	0.05	0.22	0.06	0.24	0.659	0.07	0.25	0.06	0.24	0.662	0.691	0.870
Impatience level	5.77	3.65	5.85	3.64	5.75	3.65	0.776	5.91	3.66	5.71	3.65	0.899	0.697	0.579
Observations	819		132		687		819	137		550		269	682	687

As stated earlier, households assigned to the safer brands plus testing group are further divided into two groups depending on the test result. While the test result is clearly not random, and we do not expect balance on baseline variables for these two subgroups, we still find it interesting to compare each of these groups with the comparison group. Results are shown in the appendix (Appendix Table 1). We also compare the two groups with each other (column 6 of Appendix Table 1). As expected, households whose flour tested positive for aflatoxin contamination were significantly less likely to be consuming a safer brand at baseline, were more likely to be consuming flour from own produced maize and on average they consumed cheaper maize flour, compared to the comparison households. Additionally, these households were less wealthy and had higher levels of trust than the comparison households (column 4). They were statistically similar to the comparison households with respect to the rest of the baseline variables. On the other hand, households that received a negative test result were similar to the households in the comparison group in almost all the observables, except the variable indicating whether the respondent is the household head .

Column 6 shows results of comparison of means for the households that received a positive test result and those that received a negative test result. Compared to households that received a negative test result, households that received a positive test result were less likely to be consuming any of the mentioned safer brands, were consuming lower-priced maize and were more likely to be consuming flour from their own produced maize. In addition, they were on average less wealthy compared to households that received a negative test result. Also, the household head was more likely to be interviewed for these households compared to their counterparts who received a negative test result.

All the variables that are unbalanced across any two groups are included in the regressions as controls. We also include the other baseline variables as controls in our regressions to improve the precision of our estimates.

4.5. Empirical strategy

We restrict our analysis to the respondents who had flour in their home during the first household visit (84% of the total sample). Households that did not have flour at the time of visit and were assigned the testing treatment were visited on a separate visit for the test to be done. The respondents were advised to purchase the brand they normally do for the testing. However, it is possible for a respondent to purchase a brand based on the information given during the first visit. This may have an impact on the test outcome which may affect the respondent's future choice of flour. In addition, as a robustness check for the impacts on consumption of a safer brand, we further restrict our sample to those that had flour in their homes at follow-up. Having flour at follow-up implies that the enumerator was able to verify the brand of the flour and therefore reduces any potential bias that may arise due to misreporting by the respondent.

To test the effect of the safer brands information treatment on each of the three outcomes, we estimate Equation 1, first without any controls and then including the baseline variables shown in Table 2 as controls.

$$\gamma_i = \alpha_1 + \beta_1 Treat_i + \delta X_i + \varepsilon_i \qquad eqn1$$

Where γ_i is the outcome variable (accuracy of belief, consumption of a safer brand, or median price of the brand for household i), $Treat_i$ is the treatment dummy for household i, that takes the value of 1 for a household assigned to either the safer brands information treatment or the safer brands plus testing information treatment; and 0 for a household assigned to the comparison group,

X_i is the set of baseline controls for household i and ε_i is the error term. Standard errors are clustered at the village level to account for any village level correlation.

Second, we test whether the effects of information about safer brands differ depending on whether this is offered alone versus together with a test result from a sample of the flour currently being consumed by the household. To this end, we estimate Equation 2, both with and without the baseline controls.

$$\gamma_i = \alpha_2 + \beta_2 Safebrand\ treatment_i + \beta_3 Testing\ treatment_i + \delta X_i + \varepsilon_i \qquad eqn2$$

Where $Safebrand\ treatment_i$ is an indicator of assignment to the safer brands information treatment and $Testing\ treatment_i$ is an indicator for the assignment to the safer brands plus testing information treatment; and other parameters are as defined above.

Third, we test whether the effect of information on safer brands plus testing differs based on the outcome of the aflatoxin test result using equation 3. The test result was not random and the households that received a positive test result were significantly different from the comparison households with respect to 5 out of 13 variables used in the balance test. Therefore we only estimate Equation 3 with baseline controls.

$$\gamma_i = \alpha_2 + \beta_4 Safebrand\ treatment_i + \beta_5 Positive\ result_i + \beta_6 Negative\ result_i + \beta_7 X_i + \varepsilon_i \qquad eqn3$$

Where $Safebrand\ treatment_i$ is an indicator of assignment to the safer brands information category, $Positive\ result_i$ an indicator for a household whose flour tested positive for aflatoxin contamination and $Negative\ result$ is an indicator for a household whose flour tested negative for aflatoxin contamination, and the rest are as defined above.

5. Results

5.1. Types of flour consumed at follow-up

In this section we briefly describe the types of flour being consumed by study participants at follow-up. We compare the proportions by the baseline levels and for different treatment groups, see Table 3a. Overall, relative to the baseline levels, there was an increase in the proportion of consumers consuming either of the mentioned safer brands (from 8% to 15%) and a reduction in the proportion consuming other packaged brands (75% to 73%) and posho mill flour (20% to 17%). We do not find any changes in the comparison households relative to their baseline levels, except an increase of 3% of the proportion of households consuming other packaged brands.

However, there was an increase in the proportion of households who were consuming either of the safer brands for the treatment households. The change of the proportion consuming the safer brand relative to the baseline levels is higher for those that received a test result in addition to the information on safer brand (T2). Similarly, the reduction on the proportion consuming other brands was higher for T2 (6%) than for T1 (0%). When the testing category is separated to two groups based on the test result, we find that the change in proportion consuming any of the safer brands relative to the baseline levels was higher for those households that received a positive test result (26% change) compared to those that received a negative test result (8%). We also find a higher reduction in the proportion consuming other packaged brand for the group that received a negative test result compared to those that received a positive test result. Finally, we find a higher reduction in the consumption of posho mill flour for the group that received a positive test result relative to the baseline levels.

Table 3a: Proportion of households consuming each flour type at follow-up versus baseline

Treatment group		Safer brand 1	Safer brand 2	Other packaged brands	Posho mill flour (own maize)	Posho mill flour (purchased maize)	Observations
All	Baseline	0.06	0.02	0.75	0.16	0.04	503
	Follow-up	0.10	0.05	0.73	0.15	0.02	503
Comparison	Baseline	0.08	0.02	0.74	0.15	0.02	123
	Follow-up	0.07	0.02	0.78	0.15	0.02	123
Safe brands information only treatment (T1)	Baseline	0.07	0.01	0.76	0.14	0.04	125
	Follow-up	0.09	0.06	0.76	0.15	0.02	125
Safe brands plus testing information treatment (T2)	Baseline	0.04	0.02	0.74	0.18	0.05	255
	Follow-up	0.12	0.06	0.68	0.16	0.02	255
Negative test result group (T2N)	Baseline	0.05	0.03	0.80	0.12	0.03	204
	Follow-up	0.10	0.06	0.73	0.15	0.01	204
Positive test result group (T2P)	Baseline	0.00	0.00	0.51	0.41	0.12	51
	Follow-up	0.20	0.06	0.49	0.20	0.04	51

We only consider the sample used in the main analysis.

5.2. Impact of information

Table 3 shows the effect of the safer brands information treatment (T) on the three outcomes; beliefs about the relative safety of maize flour brands, consumption of a safe brand, and median price of the brand of maize flour most recently purchased. We find a positive and significant impact of the (combined) information treatment on the three outcomes. Households assigned to the information treatment had more accurate beliefs, an increase of 9 percentage points relative to the comparison group (column 2, Table 3). In addition, they were 8 percentage points more likely to consume a safer brand compared to comparison households (column 4. Table 3). Columns 5 and 6 show the effects on a sample restricted to households that had flour in the house at the time of follow up. We find a similar result, an increase of about 8 percentage points. Finally, the treatment households were more likely to be consuming a more expensive brand compared to comparison households. The coefficient of the brand median price outcome in column 8 of Table 3 is positive and significant at 10% level.

Table 3: Impact of the information treatment on people's beliefs, consumption of safer brands and price per KG of maize flour

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Beliefs	Beliefs	Consumption of a safer brand	Consumption of a safer brand	Consumption of a safer brand	Consumption of a safer brand	Median price per KG, follow-up brand	Median price per KG, follow-up brand
Safer brands information treatment (T)	0.642***	0.631***	0.066*	0.076**	0.069*	0.076**	1.121	1.290*
	(0.185)	(0.204)	(0.033)	(0.030)	(0.040)	(0.036)	(0.701)	(0.689)
Mean of the comparison group	7.374	7.374	0.098	0.098	0.117	0.117	48.243	48.243
Baseline controls	No	Yes	No	Yes	No	Yes	No	Yes
Additional sample restrictions±					Had flour at follow up	Had flour at follow up		
Observations	506	506	503	503	389	389	432	432

Standard errors clustered at the village level in parentheses
"* p<0.10, ** p<0.05, *** p<0.01"

± All specifications (and all analysis reported in this paper) omits households that had no flour at baseline.
Three respondents could not recall the name of the brand they had recently purchased; hence we lose observations for the consumption of a safer brand outcome.
The analysis on the price outcome does not include 70 households that were consuming flour from own maize and 3 households who could not recall the name of the brand they had purchased recently.

5.3. Impact of aflatoxin tests in addition to information on safer brands

Providing information on safer brands results in more accurate beliefs about the safety of maize flour brands. The effect of this information on people's beliefs is slightly higher when this information is accompanied by test results of a sample of the flour most recently purchased by the household. Columns 1 and 2 of Table 4 show a slightly higher effect by about 2 percentage points for the households that received the test result. This difference is not statistically significant.

Columns 3-6 show the effects on the likelihood of consuming a safer brand at follow-up. We find a positive but insignificant effect of the safer brands information only treatment, T1 on the likelihood of consuming a safer brand. However, compared to the comparison group, households assigned to the safer brands plus testing information treatment, T2 were more likely to be consuming a safer brand during follow-up, by around 9 percentage points. This effect is statistically higher than the effect of T1 (Column 4, Table 4). We find similar results for the sample that had flour at follow-up. However, the difference of the effects of information alone and information and testing are not statistically different in this restricted sample.

The impact of information on the brand median price is similar to the impact on the consumption of a safer brand outcome. The impact on households that received information alone, T1 on the median price of the brand being consumed at follow-up is positive but not statistically different from 0. The effect on those assigned to the safer brands plus testing information treatment, T2 is positive and statistically significant, implying that households assigned to this treatment were on average more likely to consume a more expensive brand compared to households in the comparison group. The coefficients for the two treatments, T1 and T2 are not statistically different.

Table 4: Impact of aflatoxin tests in addition to information on safer brands

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Beliefs	Beliefs	Consumption of a safer brand	Consumption of a safer brand	Consumption of a safer brand	Consumption of a safer brand	Median price per KG, follow-up brand	Median price per KG, follow-up brand
Safe brands information only treatment (T1)	0.531**	0.541**	0.030	0.041	0.028	0.041	0.703	0.854
	(0.244)	(0.268)	(0.036)	(0.035)	(0.043)	(0.041)	(0.837)	(0.867)
Safe brands plus testing information treatment (T2)	0.696***	0.675***	0.083**	0.093***	0.092**	0.096**	1.327*	1.511**
	(0.177)	(0.196)	(0.036)	(0.032)	(0.045)	(0.040)	(0.752)	(0.716)
Baseline controls	No	Yes	No	Yes	No	Yes	No	Yes
Additional sample restrictions					Had flour at follow up	Had flour at follow up		
T1=T2: P-value	0.345	0.478	0.113	0.095	0.106	0.167	0.404	0.372
Mean of the comparison group	7.374	7.374	0.098	0.098	0.117	0.117	48.243	48.243
Observations	506	506	503	503	389	389	432	432

Standard errors clustered at the village level in parentheses
* p<0.10, ** p<0.05, *** p<0.01"
Three respondents could not recall the name of the brand they had recently purchased; hence we lose observations for the consumption of a safer brand outcome.
The analysis on the price outcome does not include 70 households that were consuming flour from own maize and 3 households who could not recall the name of the brand they had purchased recently.

5.4. Impact of the test results (aflatoxin status) in addition to information on safer brands

Further, we compare the effect of information for the households that received a positive test result (i.e. maize flour had aflatoxin levels above 10 ppb) T2P, those that received a negative test result (i.e. maize flour had aflatoxin levels below 10 ppb) T2N and households that received safer brands information only, T1. The results are shown in Table 5.

We find that the effect of information on people's beliefs was highest for the households that received a positive test result, followed by those that received a negative test result and lowest for those that received information only (Column 1 of Table 5). The effect for those that received a positive test result was significantly higher than the effect of the other two groups (T1 and T2N), while the other two groups are not statistically different from each other.

For consumption of safer brand, the effect of information for households that received either a positive test result or a negative test result is positive and significant, when compared to households in the comparison group (Column 2, Table 5). The effect was highest among the households that received a positive test result, around 22 percentage points above the comparison households. This effect is significantly higher than the effect of information alone or information plus a negative test result. The effect for the households that received a negative test result is significant at 10 percent. We do not find any statistically significant difference between the effect of information alone and information plus a negative test result.

Similar results are shown for the subsample that had flour at follow up (Column 4, Table 5). However, the effect for the households that received a positive test result is not statistically different from the effect for the households that received a negative test result, although the effect for the latter is three times larger compared to the effect for the latter.

Compared to the comparison group, the effect of information on the median price was positive and significant for the households that received a negative or a positive test result. However, the effect of information on the median price was not significant for households that received information only, T1. The p values on the test for the equivalence of the three coefficients shows that these coefficients are not statistically different.

Table 5: Impact of the test results (aflatoxin status) in addition to information on safer brands

	(1)	(1)	(3)	(4)
	Beliefs	Consumption of a safer brand	Consumption of a safer brand	Price per KG (KES)
Safe brands information only treatment (T1)	0.539**	0.041	0.042	0.854
	(0.269)	(0.035)	(0.041)	(0.867)
Negative test result group (T2N)	0.553***	0.062*	0.073*	1.342*
	(0.199)	(0.034)	(0.042)	(0.722)
Positive test result group (T2P)	1.177***	0.216***	0.208**	2.252*
	(0.333)	(0.062)	(0.087)	(1.343)
Baseline controls	Yes	Yes	Yes	Yes
Additional sample restrictions			Had flour at follow up	
T1=T2N: P-value	0.941	0.526	0.489	0.522
T1=T2P: P-value	0.056	0.004	0.044	0.282
T2N=T2P: P-value	0.048	0.020	0.148	0.477
Mean of the comparison group	7.374	0.098	0.117	48.243
Observations	506	503	389	432

Standard errors clustered at the village level in parentheses

* p<0.10, ** p<0.05, *** p<0.01"

Three respondents could not recall the name of the brand they had recently purchased; hence we lose observations for the consumption of a safer brand outcome.

The analysis on the price outcome does not include 70 households that were consuming flour from own maize and 3 households who could not recall the name of the brand they had purchased recently.

5.5. Discussion of main estimation results

Further analysis of data collected during follow up indicate that the higher likelihood of consuming any of the mentioned safer brand was likely to be driven by a desire to consume aflatoxin safer flour. In Table 6, we rerun equations 1-3 on two other outcomes; dummy variables equal to 1 if a household stated aflatoxin safety and lower price as one of the reasons for consuming their preferred brand during the follow up. Households assigned to either treatment group were more likely to state aflatoxin safety as one of the reasons for consuming their preferred brand compared to households assigned to the comparison group, column 1 Table 6. The coefficient for the group that received information only was not significant. The coefficient for the households assigned to the testing group was significant and significantly higher than the coefficient for those that received the information only. This result seems to be driven by the effect on those that received a positive test result, since we do not find any statistically different effects between households that received information only and those that received information plus a negative test result. A lesser proportion of households that received safer brands information was likely to state affordability as one of the reasons for their preferred brand. However, this proportion is not statistically different from that of comparison households for all the treatment groups except for the households that received a positive test result, see column 2 of Table 6. These results indicate that people do consider aflatoxin safety when choosing the brand or type of flour to consume.

Table 6: Impact of information on stated reasons for the preferred flour type at follow-up

	(1)	(2)
	Reason for preferred brand/type	
	Aflatoxin safety	Affordability
Equation 1		
Safer brands information treatment (T)	0.079***	-0.013
	(0.021)	(0.054)
Equation 2		
Safe brands information only treatment (T1)	0.027	-0.013
	(0.025)	(0.067)
Safe brands plus testing information treatment (T2)	0.104***	-0.012
	(0.027)	(0.059)
T1=T2: P-value	0.024	0.987
Equation 3		
Safe brands information only treatment (T1)	0.026	-0.012
	(0.025)	(0.068)
Negative test result group (T2N)	0.075***	0.051
	(0.026)	(0.061)
Positive test result group (T2P)	0.228***	-0.275***
	(0.058)	(0.083)
T1=T2N: P-value	0.151	0.331
T1=T2P:P-value	0.002	0.002
T2N=T2P: P-value	0.010	0.000
Mean of the comparison group	0.024	0.423
Observations	506	506

Standard errors in parentheses

="* p<0.10, ** p<0.05, *** p<0.01"

All specifications include baseline controls used in the main impact estimations

5.6. Heterogeneous treatment effects

In this section, we examine whether the treatment effects are different for different sub-groups based on observable characteristics. First, we hypothesize that the treatment effects are higher for those with higher levels of baseline knowledge about aflatoxin. This is motivated by the hypothesis that people with higher levels of actual knowledge on a subject are likely to form more accurate beliefs on the subject in response to new information (Mcfadden and Lusk 2015). Here we focus on the belief and likelihood of consuming a safer brand outcomes. The interaction term between people's beliefs and their baseline knowledge levels is only significant for the group that received a positive test result, column 1, Table 10. In addition, the effect on the likelihood of consuming a safer brand is not significantly different for people with different levels of baseline aflatoxin knowledge, as shown in column 2 of Table 10.

Next, we consider people's general and institutional trust levels. Previous studies have shown that consumer demand for safe food is influenced by the source of food safety information e.g government versus private certifying bodies (Ortega et al. 2011; Otieno and Nyikal 2017). This shows that the effect of information may vary depending on consumers' trust in the existing institutions. Results are shown in columns 3-6 of Table 10. The effect on the likelihood of consuming a safer brand is higher for people with higher trust levels. This is the case for the general and institutional trust levels and for all treatment effects except for the group that received a positive test result. This suggest that the effects of information on safer brands without the aflatoxin test and the effects of this information for households that received a negative test results are correlated with people's trust levels. We do not find any similar correlation for the households that received a positive test result. We hypothesize that the positive test result is convincing even to those with low trust levels. We do however find significant interaction term for the belief's outcome for this treatment group, unlike the other treatment groups.

Table 10: Analysis of heterogeneous effects

Variable X	Aflatoxin knowledge index		General trust level		Institutional trust	
	(1)	(2)	(3)	(4)	(5)	(6)
	Beliefs	Consumption of a safer brand	Beliefs	Consumption of a safer brand	Beliefs	Consumption of a safer brand
Safer brands information only treatment, T1	0.516*	0.037	0.402	0.012	0.749*	-0.038
	(0.260)	(0.035)	(0.293)	(0.038)	(0.399)	(0.051)
Safe brand plus a negative test result, T2N	0.526***	0.059*	0.436*	0.030	0.488*	-0.009
	(0.196)	(0.033)	(0.221)	(0.035)	(0.286)	(0.052)
Safe brand plus a positive test result, T2P	1.186***	0.225***	0.917**	0.178***	1.408***	0.129
	(0.338)	(0.065)	(0.357)	(0.067)	(0.420)	(0.085)
T1 x Variable X	0.407	0.001	0.528	0.115**	-0.116	0.044*
	(0.362)	(0.045)	(0.357)	(0.049)	(0.189)	(0.025)
T2P x Variable X	0.616*	0.100	0.760**	0.125	-0.137	0.050
	(0.323)	(0.068)	(0.373)	(0.097)	(0.163)	(0.040)
T2N x Variable X	0.368	0.040	0.481	0.125***	0.045	0.040*
	(0.293)	(0.043)	(0.347)	(0.046)	(0.139)	(0.023)
Variable X	-0.113	0.006	-0.445*	-0.059**	-0.086	-0.004
	(0.222)	(0.028)	(0.235)	(0.029)	(0.134)	(0.018)
Observations	506	503	506	503	506	503
Standard errors in parentheses						
="* p<0.10	** p<0.05		*** p<0.01"			

5.7. Implementation issues and robustness checks

5.7.1. Attrition

In this section, we describe the determinants of attrition at follow-up.[5] The overall attrition rate for the sample considered in the analysis was 8%. This was driven by the survey team failing to find respondents in their homes during the follow-up survey. Attrition was lowest in the comparison group at 6.8%, and highest in the safer brand plus the testing information group, at 8.5%. As shown in Appendix Table 2, this difference is not statistically significant, and is driven primarily by failure of the survey team to conduct interviews with the 12 respondents who refused to have their

[5] We do not include the 303 households that were intentionally not followed up, since they were dropped randomly and did not affect the balance between the treatments. A baseline balance test without the 303 randomly dropped households indicate similar results to the balance checks using the whole sample.

maize sampled at baseline. In Appendix Table 3, we present Lee bound estimates of the effect of the testing treatment (T2) and show that the results presented above are robust to potential attrition bias.

5.7.2. Spillover effects

Since randomization was conducted at the household level, there is a possibility of information spillover across treatment categories. To determine the extent of spillover effects, we re-estimate equations 1-3 but including a variable showing the proximity of a comparison household to a treatment household. Specifically, we add a dummy variable that indicates the presence of least one treatment household (any of the treatment categories for equation one and each of the treatment groups for equations 2 and 3) within a distance *d* of a comparison household.

We use a distance radius of 50, 75 and 100 meters. Table 9 shows results for Equations 1 and 2[6]. We do not find any indication of spillover effects on people's beliefs for all the three specifications. However, we find some evidence of spillover effects for the consumption of a safer brand. As shown in Table 9 and for Equation 1, having a treated household within 75 from a comparison household increases the likelihood of consuming a safer brand by around 9 percentage points. The spillover effect is not statistically different from the main treatment effect. As a result, the information treatment effect is higher than what was reported in Table 3 (14% compared to 8% reported in table 3).

Results from equation 2 indicate the presence of spillovers for the group that received the safe brands information only, T1 for two distances, 75 and 100 meters. As a result, the effects of this treatment are higher than what was reported in Tables 4, and in the case of 75 meters distance, significantly different from 0. In all cases, the effect of living near a household assigned to the safe brands information treatment is not statistically different from the effect of the treatment itself. This indicates the presence of spillover effects in the safe brands information treatment effects.

[6] We do not present results from Equation 3 since we do not find any spillover effects for the testing category in Equation 2

Table 9a: Test for potential information spillover effects: Equations 1b and 2b

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Distance, d		50 meters			75 meters			100 meters	
	Beliefs	Consumption of a safer brand	Median price per KG, follow-up brand (KES)	Beliefs	Consumption of a safer brand	Median price per KG, follow-up brand (KES)	Beliefs	Consumption of a safer brand	Median price per KG, follow-up brand (KES)
Panel 1									
Safer brands information treatment, T	0.749***	0.099***	1.498*	0.650**	0.136***	0.785	0.888**	0.140***	1.450
	(0.255)	(0.029)	(0.805)	(0.280)	(0.028)	(0.671)	(0.340)	(0.050)	(1.021)
Comparison HH with at least 1 treated HH within d, CT	0.300	0.060	0.497	0.028	0.090**	-0.754	0.300	0.075	0.186
	(0.355)	(0.062)	(1.049)	(0.380)	(0.044)	(0.823)	(0.386)	(0.055)	(1.008)
T-CT: P value	0.135	0.499	0.292	0.024	0.257	0.070	0.013	0.051	0.087
Panel 2									
Safer brands information only treatment, T1	0.752**	0.064*	1.061	0.706**	0.081**	0.490	1.016**	0.073	0.424
	(0.303)	(0.033)	(0.930)	(0.309)	(0.035)	(0.820)	(0.389)	(0.056)	(1.144)
Safe brands plus testing information treatment, T2	0.880***	0.114***	1.703**	0.838***	0.132***	1.144	1.146***	0.123**	1.078
	(0.241)	(0.033)	(0.813)	(0.289)	(0.034)	(0.789)	(0.368)	(0.054)	(1.105)
Comparison HH with at least 1 safe brand info treated HH within d, (CT1)	0.952	0.222	1.962**	0.026	0.189**	1.475	0.176	0.100*	0.357
	(0.699)	(0.157)	(0.947)	(0.431)	(0.081)	(1.272)	(0.361)	(0.055)	(0.921)
Comparison HH with at least 1 safe brand plus testing info treated HH within d, CT2	0.422	0.013	0.095	0.289	-0.002	-1.181	0.514	-0.011	-0.725
	(0.352)	(0.051)	(1.147)	(0.368)	(0.055)	(0.868)	(0.371)	(0.058)	(1.200)
T1=T2: P value	0.495	0.103	0.385	0.483	0.105	0.376	0.487	0.101	0.376
T1=CT1: P value	0.773	0.312	0.367	0.148	0.188	0.466	0.077	0.700	0.962
T2=CT2: P value	0.184	0.023	0.157	0.061	0.002	0.017	0.029	0.000	0.057
CT1=CT2: P value	0.506	0.149	0.248	0.605	0.043	0.106	0.547	0.177	0.545
Observations	506	503	432	506	503	432	506	503	432

Standard errors clustered at the village level in parenthesis, "* p<0.10, ** p<0.05, *** p<0.01", All specifications include baseline controls

6. **Discussions and conclusions**

We test the role of giving information about two brands that were found to be more likely to meet the aflatoxin standards on three outcomes; a) people's beliefs in the existence of safer brands, b) consumption of any of the two brands defined as relatively safer nine weeks after the information was delivered and c) the median price per kg of the brand at follow-up. We find positive and significant effects of this information on the three outcomes.

Further, we compare the effect of providing information on the safe brands alone with the effect of providing additional information in form of an aflatoxin test result of the maize being consumed by the households. While providing information only led to an increase in peoples' belief in the existence of safer brands, it did not result in a higher likelihood of consuming these brands or of consuming more expensive brands. However, providing test results resulted in an increase in people's beliefs and their likelihood of consuming safer and more expensive brands.

The effects of the test information were highest for the group whose maize flour tested positive for aflatoxin contamination. Contrary to what would be expected of a rational Bayesian, we find a positive effect of information on the households whose flour was found to be safe on their likelihood of consuming safer brands and even more expensive brands. Our result is not unique in the literature. (Luoto, Levine, and Albert 2011) examined the role of providing test results showing the quality of a household's drinking water on the demand for water treatment techniques. They found a positive effect of this information. However, they did not find any evidence that those who learned their water was contaminated increased usage more than those who were told their water was safe. Similarly, (Jalan and Somanathan 2004) found a positive (although not statistically significant) effect of a test on fecal contamination of the households' drinking water on their demand for water treatment and their expenditure on water treatment, for the households whose water was found to be safe.

Heterogeneity analysis indicates that trust levels are correlated with the effect of information. The effect of information on those that received information alone and those that received a negative test result were positively correlated with peoples' general and institutional trust. Therefore, information alone or information for households that are not exposed to risk is likely to be more effective among people who have higher trust levels.

Overall, our results suggest that providing consumers information on the safety of the maize flour products (without additional information on whether people are exposed to risk or not) may not be sufficient to create a demand for safer maize in Kenya. Providing additional tailored information that shows whether an individual is exposed to risk or not seems to increase the salience of information and results in considerable change of behavior. We conclude that the efforts to create demand for safer foods may require considerable support from the public sector through the provision of tailored information to consumers.

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Appendices

Appendix Table 1: Pre-intervention household and individual characteristics from the baseline survey and comparison of the means for the comparison group, the positive test results group and the negative test result group

	(1)		(2)		(3)		(4)	(5)	(6)
	Comparison group		Positive test results group (T2P)		Negative test result group (T2N)		(2-1)	(3-1)	(3-2)
	Mean	SD	Mean	SD	Mean	SD	P	P	p
Baseline beliefs and attitudes index	2.46	1.16	2.35	1.08	2.57	1.12	0.539	0.323	0.159
Consumption of a safer brand at baseline	0.10	0.30	0.00	0.00	0.11	0.31	0.000	0.816	0.000
Price per KG at baseline (KES)	44.39	16.69	33.09	22.30	45.96	16.90	0.001	0.340	0.000
Consumption of flour from own produced maize	0.15	0.36	0.39	0.49	0.12	0.33	0.002	0.394	0.000
Age of the respondent (complete years)	43.46	16.10	45.48	17.08	42.31	15.22	0.459	0.461	0.195
Education level of the respondent (complete years)	9.67	3.92	9.11	4.46	10.06	3.90	0.427	0.313	0.140
Respondent is household head	0.58	0.49	0.65	0.48	0.49	0.50	0.411	0.051	0.024
Aflatoxin knowledge index	0.05	0.89	-0.18	0.93	0.05	0.84	0.135	0.946	0.087
Wealth index	0.10	0.95	-0.15	0.89	0.12	1.00	0.090	0.834	0.040
General trust level	0.27	0.65	0.48	0.79	0.31	0.67	0.080	0.528	0.123
Institutional trust level	1.81	1.49	1.78	1.61	1.71	1.52	0.898	0.515	0.785
Participated in the additional interview	0.05	0.22	0.09	0.29	0.06	0.24	0.375	0.758	0.431
Impatience level	5.85	3.64	5.02	3.80	5.79	3.64	0.175	0.860	0.163
Observations	132		54		484		186	616	538

Appendix Table 2: Test for balance in attrition rates

	(1)	(2)	(3)	(4)	(5)	(6)
	Equation 1		*Equation 2*		*Equation 3*	
	Attrition	Attrition	Attrition	Attrition	Attrition	Attrition
Safer brands information treatment (T)	0.023	0.024				
	(0.029)	(0.030)				
Safe brands information only treatment (T1)			0.019	0.018	0.019	0.018
			(0.036)	(0.039)	(0.036)	(0.039)
Safe brands plus testing information treatment (T2)			0.024	0.027		
			(0.032)	(0.032)		
Positive test result group (T2P)					-0.013	-0.011
					(0.038)	(0.043)
Negative test result group (T2N)					-0.017	-0.014
					(0.030)	(0.029)
Safe brands plus no test category					0.932***	0.919***
					(0.026)	(0.034)
Prior beliefs and attitudes index		-0.012		-0.013		-0.010
		(0.011)		(0.011)		(0.009)
Consumption of a safer brand at baseline		0.041		0.042		0.033
		(0.042)		(0.042)		(0.036)
Price per KG at baseline (KES)		-0.000		-0.000		0.000
		(0.001)		(0.001)		(0.001)
Consumption of flour from own produced maize dummy		0.037		0.038		0.007
		(0.062)		(0.063)		(0.054)
Age of the respondent (complete years)		-0.002***		-0.002***		-0.002***
		(0.001)		(0.001)		(0.001)
Education level of the respondent (complete years)		0.000		0.000		-0.001
		(0.004)		(0.004)		(0.003)
Household head		0.035		0.035		0.032
		(0.026)		(0.027)		(0.025)
Aflatoxin knowledge		-0.035**		-0.035**		-0.024
		(0.016)		(0.016)		(0.015)
Wealth index		0.009		0.008		0.009
		(0.017)		(0.017)		(0.015)
General trust level		0.002		0.002		0.013
		(0.020)		(0.020)		(0.018)
Institutional trust level		-0.003		-0.003		-0.006
		(0.009)		(0.009)		(0.008)

Participated in the qualitative survey		-0.008		-0.009		0.016
		(0.046)		(0.045)		(0.047)
Impatience level 2		0.004		0.004		0.004
		(0.003)		(0.003)		(0.003)
Constant	0.068**	0.156*	0.068**	0.156*	0.068**	0.145*
	(0.026)	(0.085)	(0.026)	(0.086)	(0.026)	(0.082)
Observations	550	550	550	550	550	550
Attrition rate for the control group	.068182	.068182	.068182	.068182	.068182	.068182
Standard errors in parentheses						
="* p<0.10	** p<0.05	*** p<0.01"				

Appendix Table 3: Impact of information treatment on people's beliefs, consumption of safer brands and brand median price per KG: Lee bounds

	(1)	(2)	(3)	(4)	(5)	(6)
	Beliefs		Consumption of a safer brand		Median price per KG, follow-up brand	
	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
Safer brands information treatment (T)	0.543**	0.711***	0.063*	0.088**	0.754	1.702**
	(0.212)	(0.221)	(0.033)	(0.042)	(0.810)	(0.868)
Selected observations	506	506	503	503	432	432
Safe brands plus testing information treatment (T2)	0.591***	0.773***	0.080**	0.107**	0.910	1.974**
	(0.224)	(0.233)	(0.037)	(0.046)	(0.899)	(0.963)
Selected observations	380	380	378	378	324	324
Standard errors in parentheses						
="* p<0.10	** p<0.05		*** p<0.01"			

Appendix 1: Information script

Instructions:

This script shall be read to the different groups as follows:

1. *Comparison: Section A and B*
2. *Treatment 1: Section A, B, & C*
3. *Treatment 2: Section A, B, C & D (ALL the sections)*

A. Introduction (Read ALL THE households)

Hello, my name is { }. I am here on behalf of a project that is being implemented by Wageningen University (in Netherlands) and International Food Policy and Research Institute (a research Organization based in the US). This is a research project, and its aim is to understand people's knowledge and perception of the issue of Aflatoxin contamination and help us understand how consumers can reduce their exposure to contaminated foods. So, I am going to explain to you what aflatoxin contamination is and the possible effects of consuming contaminated foods. Please feel free to ask a question at any point if you do not understand.

[Please pause and ask if there is a question]

B. Information on aflatoxin and its prevention (Read to ALL the households)

Aflatoxin is a poison produced by certain types of fungus that live in the soil and on dead decaying matter. It affects many crops, especially maize and groundnut. This includes maize products like maize flour, the grain itself, muthokoi etc. It is not possible to see from the outside whether a crop or a product is contaminated. Aflatoxin is harmful and affects human health when consumed. Some of the health effects associated with consumption of contaminated foods are:

i. It increases the risk of liver cancer
ii. It may suppress the immune system, making you more vulnerable to infectious diseases
iii. Is suspected of causing stunting in young children
iv. It may also affect an unborn baby through the pregnant mother. This may result in low birth weight or poor growth of the child during the early years of life
v. It can result in death if taken in high concentrations.

[Please pause and ask if there is a question]

C. Information on safe brands (Read to TREATMENT 1 and TREATMENT 2 only)

Maize products made from aflatoxin contaminated maize will also be contaminated. Therefore, maize flour from contaminated maize will be contaminated and consumption of such flours might lead to the effects described previously. Scientific research has shown that maize grown from this region is contaminated. In addition, some of the brands available in the market are also contaminated. Further research has shown that the level of contamination is correlated with the price of the brand; the more expensive the brand is, the lower the chance that the flour is contaminated. This research has also shown that Hostess and Jogoo flour is relatively safe in terms of Aflatoxin contamination. This could be attributed to the fact that the millers who produce these brands are keen on the maize they buy, and they test the maze for aflatoxin contamination and the level of moisture before buying the maize

[Please pause and ask if there is a question]

D. Test of maize flour samples and sharing of the results (Read to TREATMENT 2 ONLY)

As stated earlier, aflatoxin contamination can only be detected by a test (cannot be seen by the naked eye). Now, we are going to collect a sample from the flour that you are currently consuming in the household and test it for the contamination levels.

In case more than one brand is available, ask for the most important brand for the household in terms of the amount consumed and the frequency of consumption/purchase relative to other brands.

We are going to use a rapid test designed for quick and simple tests in the field. The test will only take a few minutes (approximately 10-15 minutes). The results of the test will be shared with you and you will be present during the whole procedure. The test will show us whether the maize flour you are consuming is below or above 10 ppb. 10ppb is the maximum level of aflatoxin allowed in maize and maize products meant for human consumption in Kenya. Any sample below 10 ppb is considered aflatoxin safe while any sample above 10 ppb is considered unsafe for consumption. I am going to use a strip for the test. We are going to assess the results by looking at this strip (*show a sample of the test strip and explain the next two points*).

How to interpret the results

For test results less than 10ppb: **2 red lines** will appear on the test strip. This indicates the flour sample contains total aflatoxin less than 10ppb (negative sample). For test results greater than 10ppb or equal to 10ppb: **only 1 red line** will be visible. This indicates the sample contains total aflatoxin greater than or equal to 10ppb (Positive sample). Now we are going to proceed with the test. I am going to take 10 grams of flour from the packet or batch (in case of flour from posho mill) that is being consumed by the household now. If the flour turns out to have contamination levels above 10 ppb (positive test result), you should avoid consuming the floor as it is harmful to your health (remember the effects of consuming contaminated foods?). In this case, you should burry the contaminated flour and cover it in lime or dispose it in a pit latrine. Please do not feed the contaminated flour to any domestic animals. I am going to give you 150 KES which is worth one packet (2 KG) of hostess flour as a compensation for the contaminated flour. Please also note that exposure to aflatoxin at the levels typically observed in Kenya does not constitute an immediate risk to health. While consuming contaminated maize over many years does increase the risk of cancer, eating a few packets of maize flour over the standard will not give you cancer now. Acute aflatoxin poisoning (resulting in immediate sickness) generally only occurs when people eat maize that they know is not good.

NOTE: If the household does not have flour at the time of visit, please ask them to give you an appointment to come back after they have purchased the flour. Advise them to purchase the flour they normally purchase.

[Please pause and ask if there is a question]

Appendix 2: Definition of baseline covariates

Baseline beliefs	Constructed from 2 questions: a) any packaged maize flour available at the shop must be safe and (b) some brands of packaged flour have higher levels of aflatoxin contamination than others.

	For (a), a response of agree is assigned a value of 0, neither agree nor disagree a value of 1 and disagree a value of 2. For (b), a response of agree is assigned a value of 2, neither agree nor disagree a value of 1 and disagree a value of 0. A baseline beliefs value is calculated as the sum of the assigned values (from responses to (a) & (b). The variable therefore ranges from 0 to 4, with 4 indicating the most accurate beliefs.
Consumption of a safer brand at baseline	Dummy variable with a value of 1 if the most recently purchased flour is one of the brands described as relatively safe in the intervention script.
Price per KG at baseline (KES)	Price per KG of the most recently purchased flour
Consumption of flour from own produced maize	Dummy variable with a value of 1 if the most recently purchased flour is from own produced maize
Age of the respondent (complete years)	Age of the respondents in years
Education level of the respondent (complete years)	Number of years of formal education
Respondent is household head	Dummy variable with a value of 1 if the respondent is the household head
Flour available at the time of visit	Dummy variable with a value of 1 if there was some flour available in the house at the time of visit
Aflatoxin knowledge index	An index constructed as follows: 0.8 times the z-score of the sum of dummy variables indicating correct or affirmative answers to these four questions a) do you know of any problem/situation whereby eating maize or maize flour can make you sick? b) Have you ever heard of aflatoxin before today? c) can you please tell me what aflatoxin is? d) do you know of any maize flour brand/ type that is relatively safer in terms of aflatoxin contamination? If yes which brands? Plus 0.2 times the z-score of the number of correct responses to this question e) do you know any health effects that come from eating Aflatoxin
Wealth index	created as 0.9 times the z score of the sum of dummies indicating ownership status of a list of household assets, a dummy indicating ownership status of the house, (1 own, 0 otherwise) and the dummies indicating whether the bathroom, kitchen, piped water and kitchen are within the house; plus 0.1 times the z score of a continuous variable indicating the number of independent bedrooms owned by the household.
General trust level	A continuous variable created from the response to the question; 'Most people can be trusted' where a response of disagree is assigned 0, not sure or neither agree/disagree assigned a value of 1 and agree a value of 2. The values range from 0 to 2, with 2 indicating highest level of general trust.
Institutional trust level	A continuous variable created as the sum of the response to 2 questions: a) food processors/ millers can be trusted to supply safe food to the consumers b) the government can be trusted to protect the consumers; a response of disagree is assigned 0, not sure or neither agree/disagree assigned a value of 1 and agree a value of 2. The values range from 0 to 4, with 4 indicating highest level of institutional trust.
Participated in the qualitative survey	A dummy variable with a value of 1 if a respondent participated in additional qualitative survey
Impatience level	A continuous variable measured by asking five questions that involve a choice between a certain amount of maize flour today or a certain amount in one month. The time preference of an individual

	is indicated by the question number where an individual switch from preferring certain amount of flour in one month to preferring a certain amount today