

EatSafe: Evidence and Action Towards Safe,  
Nutritious Food

# EatSafe in Nigeria Baseline Assessment

March 2023

*This EatSafe report presents evidence that will help engage and empower consumers and market actors to better obtain safe nutritious food. It will be used to design and test consumer-centered food safety interventions in informal markets through the EatSafe program.*

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## ACRONYMS AND ABBREVIATIONS

Below is a list of all acronyms and abbreviations used in this document.

|         |  |
|---------|--|
| C       | Consumer   |
| COM-B   | Capability, Opportunity, Motivation-Behavior       |
| EatSafe | Evidence and Action Towards Safe, Nutritious Food  |
| FS      | Food safety  |
| FTF     | Feed the Future                                    |
| GAIN    | Global Alliance for Improved Nutrition             |
| HH      | Household  |
| HHR     | Household resident                                 |
| IRB     | Institutional Review Board                         |
| KAP     | Knowledge, Attitudes, and Practices                |
| LMIC    | Low- and Middle-income country                     |
| MD      | Median   |
| SD      | Standard deviation                                 |
| USAID   | United States Agency for International Development |
| V       | Vendor   |

## EXECUTIVE SUMMARY

Feed the Future's EatSafe: Evidence and Action Towards Safe, Nutritious Food (EatSafe) aims to engage and empower consumers, vendors, and other market actors to demand safe, nutritious food in traditional markets. In Nigeria, EatSafe operates in two large urban food markets in Kebbi and Sokoto States.

EatSafe's traditional market-based interventions seek to empower consumers and vendors by increasing their knowledge, attitudes, and practices (KAP) related to food safety. EatSafe's intervention assessment framework includes baseline and endline surveys, with indices of individual KAP survey questions that represent four key food safety indicators, including:

- **Saliency**, or the extent to which food safety is "top-of-mind" for respondents;
- **Self-efficacy**, or the extent to which respondents believe they are capable of making optimal decisions to ensure the safety of foods, and the extent to which they feel their actions would have an impact on food safety (i.e., locus of control);
- **Knowledge**, including awareness of food safety concepts and practices;
- **Behaviors**, including food safety practices, use of food safety cues in the market, and communications about food safety.

Considering the two markets in Kebbi and Sokoto States jointly, EatSafe engaged two market-based cohorts: consumers (n=517) and vendors (n=523). Overall, consumers and vendors possess intermediate levels of food safety knowledge, prioritize food safety when selecting a food product, and see themselves as able to implement food safety practices.

Consumers demonstrated an intermediate extent of using food safety-related cues to make decisions about which vendors and shops to patronize. Likewise, vendors implemented food safety practices in the market to a moderate extent. Neither consumers nor vendors commonly communicate about food safety issues in the market.

Across indices and cohorts, some modest gender differences were observed. Women respondents overall attributed higher saliency to food safety. Only small differences were detected in overall self-efficacy, as women respondents have slightly higher self-efficacy scores than men, but slightly lower scores related to locus of control and communication behaviors. However, no gender differences were observed in vendors' food safety practices or knowledge, suggesting that interventions can focus on the same food safety messages for both men and women.

The findings included in this report allow for EatSafe to identify specific areas to focus on during intervention implementation, and guide course correction in its early phases. Following implementation, EatSafe will conduct an endline survey with the same cohort

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of consumers and vendors, likely in late 2023. Once the endline is complete, EatSafe will be able to conduct a full analysis of how food safety KAP have changed over time. Additional, including qualitative learnings, supplemental to the baseline and endline assessments, will complement the findings and provide insights to food safety interventions in traditional markets across other LMICs.

## I. INTRODUCTION

Foodborne disease is responsible for an estimated 600 million illnesses and 420,000 premature deaths annually, worldwide (1). The majority of the foodborne disease burden falls on those living in low- and middle-income countries (LMICs) (2,3), who make up about 75% of deaths from foodborne illness (despite comprising only 41% of the global population). Young children are particularly susceptible to foodborne disease, shouldering about 40% of the burden (1). This is particularly troubling in settings with high rates of malnutrition as diarrheal disease can exacerbate childhood malnutrition (4–9), while diarrheal disease is a top risk factor for stunting (10). Such is the case in Nigeria, which suffers from persistent malnutrition, with 37% of children under five years old stunted and 18% suffering from wasting (11).

Traditional food markets are a key node for food systems, bringing together vendors and consumers in a food environment that supports billions of people worldwide, while operating under unique settings and challenges (12,13). As in many other LMICs, Nigerian traditional markets are beset by inadequate resources, limited regulatory oversight, and poor physical infrastructure, all of which exacerbate food safety risks (14). In particular, EatSafe found that consumers could be exposed to a very high risk of salmonellosis – the illness associated with the bacterial pathogen *Salmonella* – if they consumed beef, fish, or fresh tomato sold in Nigerian traditional markets (15).

Managing foodborne diseases extends beyond the physiological impacts on human health; food safety contains behavioral and psychosocial dimensions, expressed in human activities throughout the supply chains, which can lead to the selling and purchasing of safe or unsafe food.<sup>1</sup> These include knowledge of food safety, salience of food safety in the culture, self-efficacy in implementing behaviors that promote food safety, and actual implementation of such practices and behaviors on a regular basis (16–19). **Knowledge** refers to an individual’s familiarity with concepts and techniques relevant to food safety. **Salience** is defined as the importance of a particular topic in relationship to others. **Self-efficacy** refers to confidence a person has that they can complete a task and to achieve a desired outcome. **Behaviors** encompass the manifestation of food safety knowledge, salience, and self-efficacy in practice, and play critical roles in mediating food safety-related risks. Salience, knowledge, and self-efficacy are key factors that, together with access to resources and a strong enabling environment, can lead to sustainable behavior change (20). As such, they are central in ensuring consistent and equitable choice of safe, nutritious foods, and for sustaining a long-term culture of food safety.

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<sup>1</sup> Here, psychosocial refers to the complex interactions of behavioral, social, emotional, and environmental factors that influence outcomes.

Knowledge, Attitudes, and Practices (KAP) assessments regarding food safety have been undertaken in many settings, including traditional food markets (21–24). However, only limited efforts have been made to develop rigorous indices that can be used to monitor and track changes over time and across contexts. This study has developed and deployed a series of standardized indices for measuring change in key behavioral and psychosocial aspects of food safety among consumers and vendors in traditional food markets in Nigeria.

### *1.1. GOAL AND SCOPE*

A central goal of the EatSafe in Nigeria program is to develop and test behavior change interventions that foster improved food safety in traditional food markets, by leveraging consumer demand. Within the program, the goal of the baseline/endline assessment is to evaluate changes in food safety KAP in two populations, consumers and vendors, in traditional markets in the Kebbi and Sokoto States of northwestern Nigeria.

The assessment takes place in conjunction with food safety interventions that seek to increase consumer demand for safe food and facilitate the vendors' ability to meet such demand. The interventions are applied in two large urban markets in Nigeria, without a control group. The endline assessment will be conducted after interventions have run for at least 12 months - likely in late 2023. The baseline and endline will be used to evaluate the potential impact of the interventions on KAP using key food safety indicators.

This report discusses:

- A summary of the study design and data collection methods for the baseline/endline assessment;
- A description of the custom indices used to assess changes in KAP, and the rationale behind their development;
- The results of the baseline assessment in two large traditional food markets in Nigeria.

## **2. METHODS**

### *2.1. STUDY SETTING*

The study was conducted in Kebbi and Sokoto states, in northwestern Nigeria. Within Kebbi state, the study focused on one large traditional market (Central Market) within the Birnin Kebbi, the largest urban area in the state. Within Sokoto state, the study focused on one large market (Dankure Market) in Sokoto city, also the largest urban area in the state. The two markets were considered jointly. The geographic focus was determined in consultation with key local stakeholders, based on local priorities and in alignment with USAID and Feed the Future's existing policies and programs.



Criteria used to select the geographic area included: city being within a Feed the Future Zone of Influence; undernutrition being prevalent in the state; target FTF foods being widely consumed in the city; city being of sufficient size to have multiple markets; and the city and state having sufficient security to allow for the work to take place safely. Market selection criteria are shown in [Appendix 1](#). Ethics approval (Approval Number NHREC/01/01/07/2007-13/05/2022) was obtained through a Nigerian Institutional Review Board (IRB), the National Health Research Ethics Committee of Nigeria (NHREC). Full methods are detailed in the study protocol, available upon request.

The study encompassed a basket of key commodities sold at the markets, accounting for commodities that are particularly relevant to Feed the Future programs in Nigeria: beef, aquaculture fish, vegetables, and grains (i.e., rice, maize, cowpea, soybean). Those commodities are commonly at high risk for contamination, have high inherent nutritional value, are accessed via traditional markets for domestic human consumption, and are sold directly to consumers. They were identified in consultation with USAID and key local stakeholders, based on local priorities and alignment with existing USAID Feed the Future objectives in Nigeria.

## 2.2. MEASUREMENT APPROACH

The baseline/endline assessment is based on tracking changes in key indicators of food safety KAP among consumers and vendors ([Appendix 2](#)). The measurement approach leverages summative scales-based techniques, where each module has a fixed score range. Measurement tools are available upon request. Overarching research questions of the assessment are:

- To what extent does EatSafe’s package of interventions change consumers’ and vendors’ food safety KAP?
- What level of change in consumers’ and vendors’ KAP is attributable to engagement with specific elements of the intervention package? (i.e., is engagement in a specific activity a significant predictor of change?)

The KAP indicator categories (indices) used in this study include salience, self-efficacy, knowledge, and behaviors, where salience and self-efficacy were chosen as key “attitudes” (the A in food safety KAP). **Table 1** provides a brief description of these four general indices and the sub-indices they include, including their computation methodologies in [Appendix 3](#).

While there are no comprehensive standard food safety KAP tools available, assessment approaches have been developed to measure some aspects, such as food safety knowledge. For instance, a percent of correct responses out of the total number of questions is commonly used to determine how much an individual knows about the topic (19,25). However, assessments of knowledge on how to carry out food safety

practices is less common. Studies conducted by EatSafe in traditional markets in both Ethiopia and Nigeria found that visual cues were used by consumers to determine if a food was unsafe—e.g., if a food had dirt on the outside of it or if a produce item was blemished (21,26,27). A positive relationship has been found between increased salience of food safety (i.e., a higher rating of food safety as being important) and behaviors that promote food safety (16). In studies conducted by EatSafe in Nigeria and in Ethiopia, food safety was within the top five attributes consumers consider when selecting a market and an individual vendor, but the most salient attribute was by far price (21,26). Likert scales are commonly used to measure self-efficacy (18,28). For example, an EatSafe formative study conducted in Nigeria included a Likert scale that measured consumer confidence in choosing safe food. The study found that vendors and suppliers had high levels of confidence, which was leveraged in developing behavioral interventions (26).

**Table 1.** Description of indices and sub-indices included in this assessment

| INDICES       | SUB-INDICES                    | DESCRIPTION   | GROUP* |
|---------------|--------------------------------|---|--------|
| SALIENCE      | <b>Composite</b>               | Combination of Ranking and Choice indices into one Salience index   | C,V    |
|               | <b>Ranking</b>                 | A ranking of the importance of “food safety” among 11 food, shop, and vendor attributes (e.g., price, familiarity with vendor)  |        |
|               | <b>Choice</b>                  | How often respondents chose “food safety assurance” as one of the factors that influences the decisions they make about the food they purchase, over 8 rounds of factors.   |        |
| SELF-EFFICACY | <b>Composite</b>               | Combination of Likert scale data of Perceived self-efficacy and Locus of control into one Self-efficacy index   | C,V    |
|               | <b>Perceived Self-efficacy</b> | Series of 9 questions capturing respondents’ subjective understanding of their capability to make optimal decisions to ensure FS (e.g., confidence in ability to access information about food safety, identify if vendors use food safety best practices that prevent contamination) |        |
|               | <b>Locus of Control</b>        | Series of 9 questions capturing the extent to which respondents believe they have power over FS outcomes  |        |
| KNOWLEDGE     | <b>Knowledge</b>               | 16-item module of true/false questions on FS concepts (e.g., handwashing, cleanliness of stalls, cross-contamination)   | C,V    |
| BEHAVIORS     | <b>Composite</b>               | Combination of Likert scale and self-reported frequency data into one Behavior index  | C,V    |
|               | <b>Communication</b>           | Frequency of respondents’ communication about FS (e.g., on vendor hygiene, food handling practices, food safety resources; in the last month from never to always)  | C,V    |
|               | <b>Consumer Practices</b>      | Frequency of self-reported FS actions while shopping (e.g., assessing vendor hygiene, assessing food storage conditions, checking for damage of food or packaging; in the last month from never to always)  | C      |
|               | <b>Vendor Practices</b>        | Frequency that respondents self-reported performing FS actions (e.g., waste disposal, wearing personal protective equipment like gloves, elevation of food products off the ground)   | V      |
|               | <b>Use of FS Cues</b>          | Number of food safety-related cues identified by respondents from images of traditional markets (e.g., stall cleanliness, food storage, elevation of food from the ground)  | C      |

\* “C” refers to consumer respondents, “V” to vendor respondents. FS refers to “food safety.”

### 2.3. DATA COLLECTION

EatSafe used a convenience sampling approach (non-randomized) to enroll vendors and consumers into the study cohorts, resulting in a total of 1,040 respondents (523 vendors and 517 consumers). EatSafe used target quotas for vendor commodity category and vendor/consumer gender to ensure adequate representation. Inclusion criteria for both groups included 18 years of age or older and able and willing to give informed consent. Exclusion criteria included being unable to communicate in English or Hausa or unwilling to be recontacted for follow-up activities. The full list of inclusion and exclusion criteria is in [Appendix 4](#).

EatSafe administered the survey in June 2022 using a structured questionnaire in either Hausa or English, depending on respondent preference. Interviews took place primarily in the market for vendors, and at the respondent's home for consumers. EatSafe received and recorded informed oral consent prior to commencing the interview. EatSafe also obtained consent for recontact and follow-up measurement orally.

### 2.4. DATA ANALYSIS

EatSafe computed and normalized indices and sub-index scores, and computed descriptive statistics (mean, SD, and median) for each measure<sup>2</sup>. Indices and sub-index values were disaggregated by group and gender, and t-tests were performed to determine statistically significant differences across groups. Index values were compared across groups (vendor and consumer) within each gender (male and female) to better understand the influence of gender on food safety KAP. To identify the relative importance of group (consumer and vendor) and gender (male and female) in predicting index values, multiple linear regression models were constructed for each index using gender and group as predictor (independent) variables. Given these indices have yet to be validated, all measures are weighted equally. The analysis below considers only the baseline data, treated as an independent cross-sectional survey. It will be followed by an endline survey and analysis to examine the rates of change in consumer and vendor KAP in the markets where EatSafe operates.

## 3. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

The demographic characteristics of respondents (523 vendors and 517 consumers) are summarized in **Table 2**. Among vendors, men constituted 80% of the cohort, while the consumer cohort was majority female (61%). Both groups were relatively young on average, with a mean age of 36 years for vendors and 31 for consumers. The interview language (a proxy for preferred spoken language) for most respondents was Hausa, used by 88% of vendors and 70% of consumers.

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<sup>2</sup> Indices are normalized to a 100-point scale, with 0 and 100 the lowest and highest possible index score.

Most vendors (75%) were head of their household; this was much more common among male (90%) than female vendors (17%). This trend was mirrored in the consumer population: while 62% of male consumers identified as head of household, just 18% of female consumers did. Overall, findings suggest that food shopping responsibilities are not held by the head of household in a majority of local households.

**Table 2. Consumer and Vendor Cohort Demographics**

| CHARACTERISTIC               |                | CONSUMERS<br>(N=517) | VENDORS<br>(N=523) |
|------------------------------|----------------|----------------------|--------------------|
| <b>INDIVIDUAL LEVEL</b>      |                |                      |                    |
| Gender                       | Male           | 39% (204)            | 80% (423)          |
|                              | Female         | 61% (313)            | 20% (109)          |
| Median age, in years (range) |                | 29 (18 – 57 years)   | 35 (18 – 70 years) |
| Marital Status               | Married        | 57% (294)            | 78% (417)          |
|                              | Not Married    | 43% (223)            | 22% (115)          |
| Completed Education          | None           | 5% (28)              | 13% (68)           |
|                              | Pre-Primary    | 0% (0)               | 0% (1)             |
|                              | Primary        | 4% (21)              | 52% (275)          |
|                              | Secondary      | 46% (237)            | 14% (76)           |
|                              | Post-Secondary | 45% (231)            | 13% (68)           |
| Survey Language              | Hausa          | 79% (406)            | 88% (470)          |
|                              | English        | 21% (114)            | 12% (62)           |
| <b>HOUSEHOLD LEVEL</b>       |                |                      |                    |
| Respondent is head of HH     | Yes            | 35% (183)            | 75% (397)          |
|                              | No             | 65% (334)            | 25% (135)          |
| # of HHR (range)             |                | 6 (1 – 32 people)    | 8 (1 – 50 people)  |
| # of HHR <5 years (range)    |                | 1 (1 – 5 people)     | 2 (0 – 10 people)  |

*Note: HH refers to “household,” while HHR refers to “household residents.”*

## 4. RESULTS

### 4.1. INDICATOR VALUE

A range of index scores were observed among surveyed consumers and vendors, indicating that the indices effectively capture variability in food safety knowledge, attitudes, and practices in the target population (**Table 3**). For all indices, a higher score indicates a higher level of the associated indicator, e.g., a higher degree of knowledge on food safety. Significant increases in index scores from baseline to endline signify a positive impact of EatSafe's interventions. EatSafe is using 85% as an initial benchmark of high performance for all indices; this benchmark is subject to change if further data collection events elucidate population-level trends in the indicators. At the same time, medium-high index scores at baseline indicate factors where room for improvement may be limited.

The highest values were observed for the **self-efficacy index**, with both consumers and vendors achieving nearly 75% of the maximum score. In contrast, both groups had lowest performance in the behavior index, achieving less than 50% of the maximum score on average. The salience index was the most divergent across consumers and vendors, with consumers exhibiting significantly higher salience of food safety than vendors. Values observed for the knowledge index were modest for both groups (just above 50% of the maximum score), indicating substantial opportunity for progress.

**Table 3. Indicator results, by respondent group and indices**

| INDICATOR     | INDICES                        | CONSUMERS <sup>1</sup> |                   | VENDORS <sup>2</sup> |                   | TOTAL <sup>3</sup> |                   |
|---------------|--------------------------------|------------------------|-------------------|----------------------|-------------------|--------------------|-------------------|
|               |                                | MD                     | MEAN (SD)         | MD                   | MEAN (SD)         | MD                 | MEAN (SD)         |
| SALIENCE      | <b>Composite Salience*</b>     | <b>70 %</b>            | <b>68 % (±20)</b> | <b>57 %</b>          | <b>58 % (±19)</b> | <b>63 %</b>        | <b>63 % (±20)</b> |
|               | <b>Ranking*</b>                | 73 %                   | 66 % (±25)        | 64 %                 | 56 % (±27)        | 64 %               | 61 % (±27)        |
|               | <b>Choice*</b>                 | 62 %                   | 70 % (±23)        | 50 %                 | 59 % (±21)        | 62 %               | 65 % (±23)        |
| SELF-EFFICACY | <b>Composite Self-efficacy</b> | <b>73 %</b>            | <b>73 % (±13)</b> | <b>74 %</b>          | <b>72 (±12)</b>   | <b>73 %</b>        | <b>72 % (±13)</b> |
|               | <b>Perceived Self-efficacy</b> | 76 %                   | 74 % (±16)        | 76 %                 | 73 (±16)          | 76 %               | 73 % (±16)        |
|               | <b>Locus of Control</b>        | 72 %                   | 71 % (±13)        | 72 %                 | 71 (±12)          | 72 %               | 71 % (±13)        |
| KNOWLEDGE     | <b>Knowledge*</b>              | <b>56 %</b>            | <b>55 % (±11)</b> | <b>50 %</b>          | <b>52 % (±11)</b> | <b>56 %</b>        | <b>54 % (±11)</b> |
| BEHAVIORS     | <b>Composite Behaviors*</b>    | <b>46 %</b>            | <b>47 % (±15)</b> | <b>39 %</b>          | <b>41 % (±10)</b> | <b>42 %</b>        | <b>44 % (±13)</b> |
|               | <b>FS Communication</b>        | 26 %                   | 32 % (±19)        | 29 %                 | 33 % (±15)        | 28 %               | 33 % (±17)        |
|               | <b>Consumer Practices</b>      | 47 %                   | 47 % (±19)        | NA                   | NA                | NA                 | NA                |
|               | <b>Vendor Practices</b>        | NA                     | NA                | 48 %                 | 49 % (±9)         | NA                 | NA                |
|               | <b>Use of FS Cues</b>          | 57 %                   | 60 % (±20)        | NA                   | NA                | NA                 | NA                |

Note: MD refers to median; SD refers to standard deviation; and FS refers to food safety.

<sup>1</sup> For consumers, N=520 across all indicators, except for Composite and Ranking for Salience, which were both N=499.

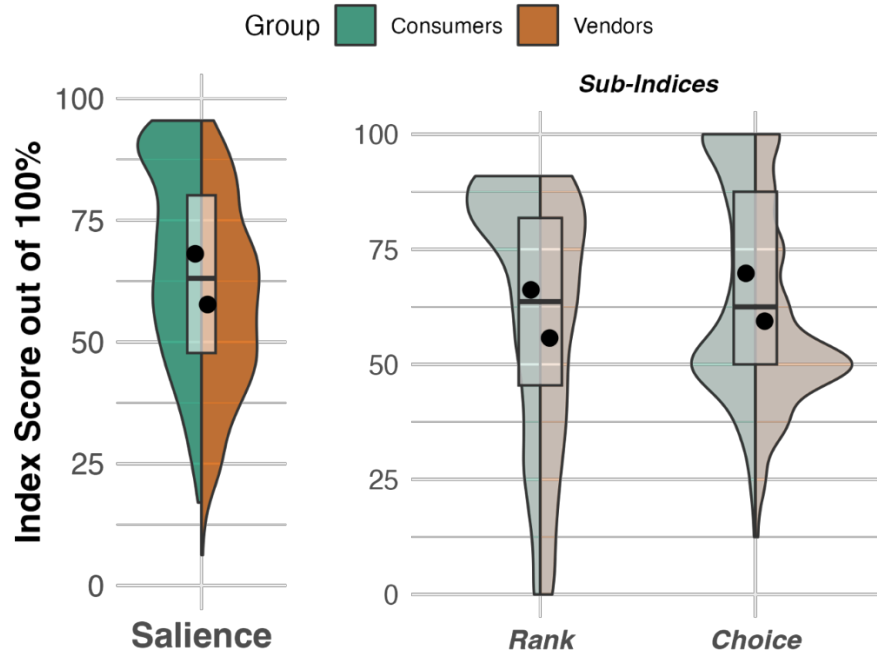
<sup>2</sup> For vendors, N=532 across all indicators, except Salience (N=468 for Composite; N=521 for Ranking; and N=479 for Choice, since not all respondents successfully completed these two modules).

<sup>3</sup> Across both groups, N=1,052, except for Salience, which varied corresponding to the sample sizes above.

\* Statistically significant group differences between consumers and vendors at  $p < 0.01$  significance level.

#### 4.1.1. SALIENCE

Salience is the importance or “top-of-mindedness” of food safety as a factor in purchasing choices (for consumers) or in the success of their business (for vendors). Higher scores indicate that food safety is seen as important compared to other relevant factors. See **Table 1** for descriptions of the sub-indices. For both consumers and vendors, higher levels of salience were observed for the rank sub-index (ladder ranking of food safety among other factors), and relatively lower salience was observed for the “choice” sub-index (evaluated as a series of choices between two products of different properties, including the assurance of their safety). In the composite salience index, 20% of consumers and 32% of vendors scored below 50%. Additionally, 26% of consumers and only 7% of vendors scored at or above 85, used in this report as an approximate threshold for “high scores.” These trends were mirrored relatively evenly in the salience sub-indices (**Figure 1**).



**Figure 1.** Distribution of food safety salience index and sub-index values, by group <sup>3</sup>

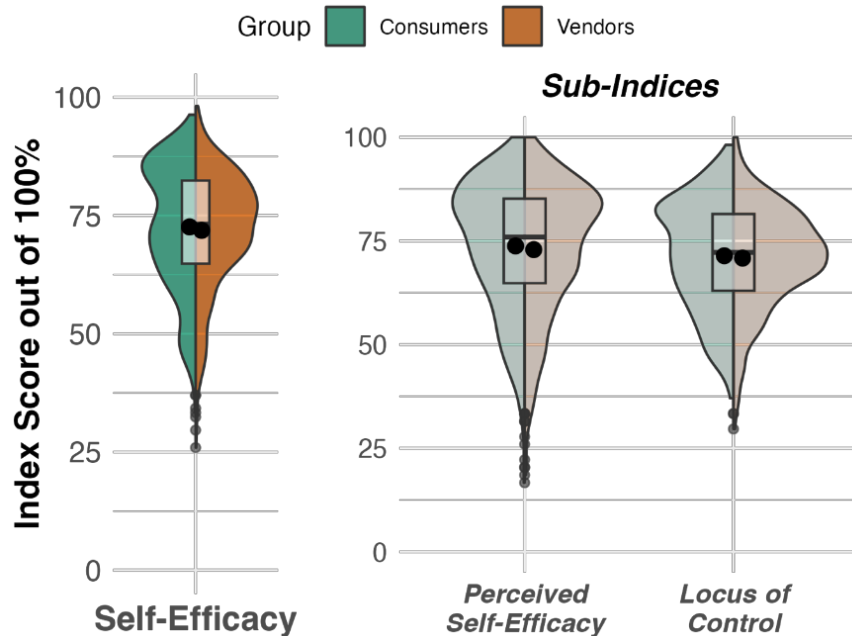
#### 4.1.2. SELF-EFFICACY

Self-efficacy reflects confidence and control vendors and consumers believe they have in being able to take actions in the market to purchase safer food. Higher scores of this index indicate that the respondents report higher levels of confidence and control in their ability to purchase safe food.

<sup>3</sup> The mirrored “violins” on the left and right represent the distributions of consumers’ and vendors’ scores, respectively. Boxplots represent cumulative scores across the two groups. Points represent mean scores for each group.



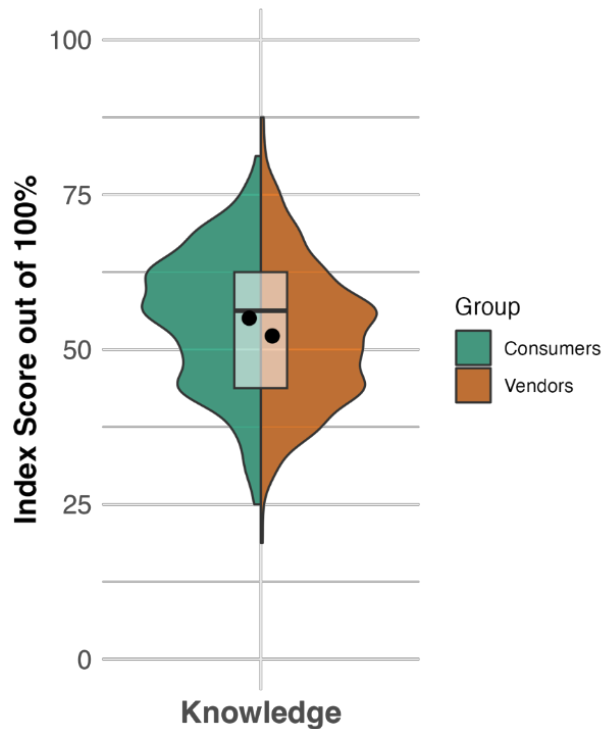
Compared to other indices, the self-efficacy index yielded the highest average score (around 75%) for both consumers and vendors. Only a small fraction (9% of consumers and 8% of vendors) achieved less than 50% of the maximum score for the salience index. While only a few respondents scored poorly in this index, 23% of consumers and 12% of vendors scored at or above 85%. The distributions of scores were comparable across the self-efficacy sub-indices, indicating similar levels of confidence in their abilities and locus of control (**Figure 2**).



**Figure 2.** Distribution of food safety self-efficacy index and sub-index values

#### 4.1.3. KNOWLEDGE

The knowledge index provides an evaluation of responders' knowledge of food safety facts or "how to," and was scored as the percent of correct answers over a series of true/false questions. The mean index scores were 55% and 52% for consumers and vendors, respectively, indicating a moderate level of food safety knowledge for both groups on average. 39% of consumers and 53% of vendors scored at or below 50% of the maximum score, and <1% of respondents scored at or above 85%.



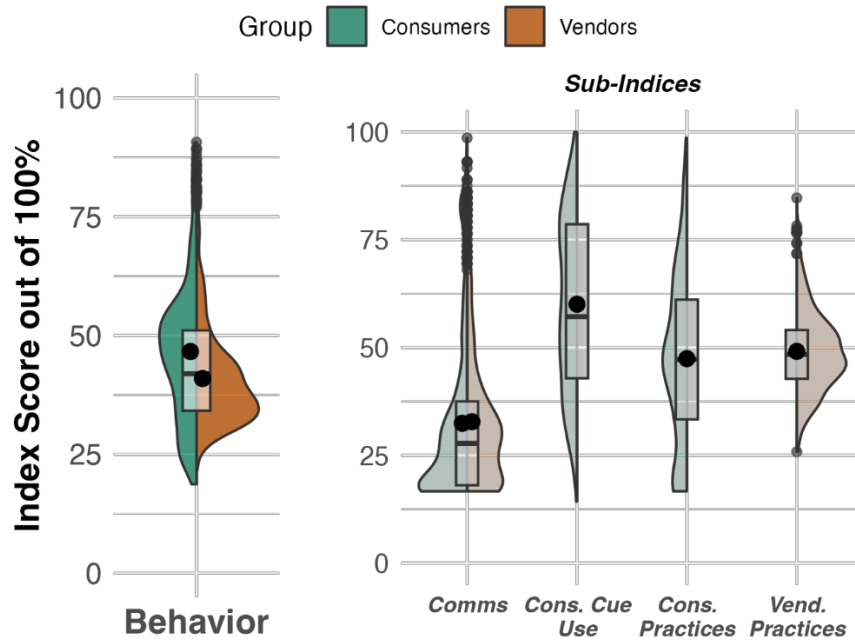
**Figure 3.** Distribution of food safety knowledge index and sub-index values

#### 4.1.4. BEHAVIOR

Behavior was assessed with an index comprising two basic components: 1) food safety communication, and 2) self-reported food safety practices. The tools used to assess practices were different for each group and constituted separate sub-indices (**Figure 4**). For consumers, a third component on use of food safety cues (i.e. visible good practices, such as vendors displaying food elevated from the ground, maintaining a clean waste-free floor, using clean water) to inform purchasing decisions was also incorporated, given the importance of this behavior to EatSafe. Among all categories assessed, both groups yielded the lowest scores in the behavior index, with consumers and vendors achieving an average of 47% and 41% of the maximum score.

The sub-indices exhibited substantial variance (i.e., spread across the score range), indicating that consumers and vendors practice some behaviors better than others. Scores were particularly low for food safety-related communication behaviors, such as asking or reporting on how vendors clean their work surfaces or how long ago their produce was harvested. Average behavior index scores were 32% for consumers and 33% for vendors, indicating that there are generally low levels of communication about food safety in the target population. While communication scores were strikingly low, more moderate values were observed for self-reported food safety practices (e.g. inspecting freshness or ensuring that raw and prepared foods are separated, etc.) in

both groups, with average scores near 50%. Consumers scored highly in the cue use sub-index (60% of the maximum score on average), These moderate levels indicate that consumers and vendors are lagging in behaviors that could decrease their risk of adverse food safety outcomes.

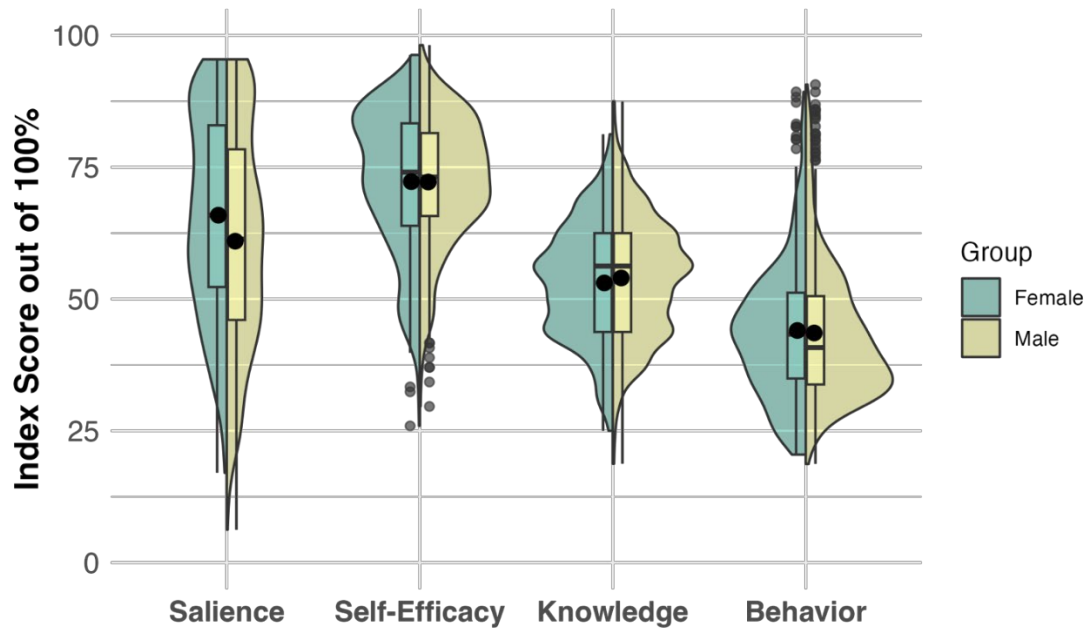


**Figure 4.** Distribution of food safety behaviors index and sub-index values

Over 60% of consumers and 85% of vendors yielded scores at or below 50% of the maximum, indicating that a majority of the population is performing poorly in identified food safety behavior domains. Just 2% of consumers and zero vendors achieved scores at or above 85% of the maximum score.

#### 4.2. GENDER DIFFERENCES IN FOOD SAFETY KAP

There was little difference in food safety KAP between male and female respondents, broadly speaking, when considering consumers and vendors together (**Figure 5**). Only food safety salience yielded a statistically significant difference ( $p < 0.01$ ) by gender, with female respondents showing higher levels.



**Figure 5.** Composite food safety indices, by gender<sup>4</sup>

Examination of sub-indices, also considering consumers and vendors together, revealed some statistically significant gender-wise differences in specific domains, although absolute differences were modest ([Appendix 5](#)). For example, male respondents had higher scores than females in perceived self-efficacy (74% vs. 72% on average), while females had higher scores in the food safety locus of control sub-index (72% vs. 70%). Moreover, within behaviors, male respondents had higher scores in food safety communication (34% vs. 31%), and self-reported food safety practices (51% vs. 45%).

When consumers and vendors were considered separately, within each group there were significant differences in index values across genders, although absolute differences were small on average (<10%). Among consumers significant gender-wise differences were observed for all indices except salience, with males yielding higher scores, although differences were modest. This trend was somewhat reversed in the vendor population, where females had significantly higher scores than males in the salience and self-efficacy indices. Male vendors had significantly higher scores than female vendors in the knowledge index, while no significant differences were observed in the behavior index. Linear regression models for each index, using gender and group as predictor variables, provided further evidence that group (consumer or vendor) is equally or more important as gender in determining index values.

<sup>4</sup> These results represent consumers and vendors combined. Black dots represent group mean index values and boxplots depict group medians and quartiles of the index values.

## 5. DISCUSSION AND IMPLICATIONS

This report summarizes the baseline levels of food safety KAP indicators across two cohorts (consumers and vendors). In combination with a future endline assessment, this study aims to evaluate the effectiveness of EatSafe program interventions. The baseline findings reveal that across the domains of food safety salience, self-efficacy, knowledge, and behaviors, there is variation within and across consumer and vendor populations in traditional food markets in northwestern Nigeria. While baseline findings illuminate strengths and weaknesses that may be leveraged in intervention implementation, scores that are high at baseline suggest that changes from baseline to endline may be modest in some domains.

### 5.1. HIGH, MODERATE AND LOW FOOD SAFETY SCORES

Both consumer and vendor populations yielded high average scores in the “attitude” indices comprising food safety salience and self-efficacy (ranging between 56% and 74% across sub-indices in these categories, and across vendors and consumers; see **Figures 1 and 2**). This illustrates that food safety issues are important to vendors and consumers in traditional markets, and that there is a high degree of confidence in one’s ability to control food safety outcomes. These findings are consistent with and add to formative research findings (21,22,29). High scores in the self-efficacy index may be partially attributable to respondents’ tendency to over-estimate, or be overly confident in, their own knowledge or abilities (30,31). In this case, it could be useful to focus endline assessments on how effectively the lower-scoring individuals can “catch up” to the population mean.

Overall, food safety knowledge scores were mid-range of the indices, illustrating that despite a solid foundation of knowledge held by most consumers and vendors, there is need for continued learning about food safety. This presents an opportunity for EatSafe to reinforce knowledge that is lacking or under-developed in the local populations. Further examinations of correct and incorrect answers to individual questions in the knowledge module could elucidate gaps that could be targeted in capacity-building activities over the course of EatSafe’s interventions. For example, only 29% of vendors and 22% of consumers correctly answered that food unfit for consumption does not always exhibit changes in smell, color, or taste, and just 32% of vendors and 39% of consumers correctly answered that wearing gloves is not a substitute for hand cleansing. Other areas where knowledge was sub-optimal included surface cleaning and risks associated with dust/grime for consumers and the importance of food elevation for vendors.

Across cohorts, the behavior index was the lowest scoring, representing a substantial gap and a ripe area of focus. While survey findings indicate that food safety is important, actionable and understood, these attributes together do not necessarily

translate into practiced behaviors. Low scores were observed for the food safety communication sub-index, suggesting consumers and vendors have, at present, low levels of communication about food safety—likely reflecting cultural drivers and social dimensions. While trust is important in market actor relationships, trust in a market actor may not guarantee the safety of the food itself (21,22). The other behavior sub-indices yielded relatively low scores as well, highlighting the potential for improving food safety-related practices (e.g., separating raw animal-source foods and fresh fruits and vegetables to limit cross-contamination risks) in both consumers and vendors.

### 5.2. GENDER SENSITIVE LEARNINGS

Only modest gender-related differences were observed in the index scores, suggesting that males and females have similar KAP related to food safety among the study population. However, some gender-related trends emerged that illustrate the importance of designing gender-sensitive interventions. Female respondents scored higher in food safety salience than males, suggesting that a focus on increasing the salience of food safety for men might be a good priority. At endline, it would be considered a success to resolve this gap by bringing both males and females to a consistently high level.

On the other hand, when examining gender-based differences in scores within consumer and vendor populations, more substantive differences were revealed. Male consumers had higher scores than their female counterparts on three out of the four indices (self-efficacy, knowledge, and behavior), while the directionality of trends was more mixed among vendors. These findings suggest that both group (consumer and vendor) and gender have some influence, and the intervention assessment at endline should examine results within and across these sub-groups.

### 5.3. STUDY LIMITATIONS

There are limitations to this assessment. Given cohort size and study location (two markets), findings may not be applicable to other areas and populations. Second, indices in this assessment predominantly rely on self-reported data, which can inherently result in a certain degree of response bias. Third, key indicators are, by necessity, a subset of all possible relevant metrics. These indicators do not provide a full picture of behavioral dimensions, and by themselves can highlight associations across indices but cannot demonstrate causal relationships between the indices. To better understand impact pathways, EatSafe's approach combines the higher strength of evidence of a large-sample quantitative assessment with the nuance of complementary targeted qualitative assessments. The latter can help interpret quantitative findings and form hypotheses on how participants think and act, i.e., on the connections between factors that lead (or not) to behavior change. Additionally, given that EatSafe's interventions are novel, as in all research studies it is inherently difficult

to anticipate the level of quantitative difference that will result from the program. Lastly, while the approach and tools were piloted before the assessment, further validation, such as applying them in a greater number of countries, would be necessary to ascertain internal and external validity when/if implementing assessment tools outside of this study population.

#### *5.4. IMPLICATIONS FOR INTERVENTION ASSESSMENT*

Results of the baseline assessment, as well as the pilot conducted to test the survey tools before deployment, confirmed that the fit-for-purpose tools EatSafe developed to assess changes in key KAP indicators are suitable to the purpose. Baseline results also inform EatSafe intervention refinements, as they provide a firmer understanding of the extent of change that can be achieved, and in which domains that change is most likely to occur.

The baseline and endline will be analyzed together to evaluate the impact of the interventions based on varying levels of food safety indicators measured. Additionally, the endline will validate whether these indices can meaningfully detect change. While not providing evidence of causality, positive changes among the indicators would support the hypothesis that food safety interventions had positive impacts on food safety KAP among consumers and vendors. Planned qualitative and quantitative assessments during intervention will complement results from the baseline/endline assessment and provide nuance to better interpret findings. Evidence generated from this baseline assessment can support intervention selection and development program decisions relevant to food safety and consumer demand in traditional markets.

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## 7. APPENDICES

### 7.1. APPENDIX 1: MARKET SELECTION CRITERIA

Open air fresh food markets to include in the program were identified based on a set of criteria related to the goals of the research and the nature of the intervention (see **Table A3**). Two markets, meeting all required criteria and several desired criteria were included: the Central market in Birnin Kebbi and the Dankure market in Sokoto city.

**Table A3.** Market Selection Criteria

| MARKET SELECTION CRITERIA   |
|---|
| <b>REQUIRED</b>   |
| Market operates at least weekly   |
| Market engages in retail (i.e., direct to consumer) sales (possibly in addition to wholesaling)   |
| Market exists in a fixed location, and its boundaries can be defined (and there are no plans to remove it or significantly alter its borders)                                 |
| At least 4 of 7 target food categories are sold at the market (with particular attention to meat/fish, fresh fruits and vegetables, other wet or temperature-sensitive foods) |
| There are at least 10 vendors of raw commodities (e.g., raw meat or fish, fresh fruits and vegetables, not only dry or ready-to-eat foods) at the market                      |
| Market authorities (and vendors, if feasible to evaluate) express a willingness to work with the project  |
| There exists a market association   |
| <b>DESIRED</b>  |
| Market operates daily   |
| Most vendors sell at that market regularly, with the potential for lasting relationships with consumers   |
| The market association has buy-in from vendors and interest in improving market conditions  |
| Vendors and consumers groups include both men and women.  |

## 7.2. APPENDIX 2: EATSAFE'S INDICATORS FOR CONSUMERS AND VENDORS

The intervention tracks changes in key indicators of the two cohorts of consumers and vendors, illustrated in **Tables A1** and **A2**, respectively. “C” refers to consumers and “V” refers to vendors.

**Table A1.** *EatSafe's Indicators for Consumers*

| OUTPUT                        | TYPE             | INDICATOR   |
|-------------------------------|------------------|---|
| Self-efficacy                 | Attitude/ Belief | % of C who believe they are able to take actions in the market to purchase safer food |
| Purchase choices              | Behavior         | % of C who use food safety knowledge/cues to inform food purchasing decisions         |
| Communications and Engagement | Behavior         | % of C who report engaging in conversations on food safety with market actors         |
| Awareness/ Knowledge          | Knowledge        | % of C who can name ways to identify safer food and/or vendors                        |

**Table A2.** *EatSafe's Indicators for Vendors*

| OUTPUT                          | TYPE             | INDICATOR  |
|---------------------------------|------------------|--|
| Self-efficacy                   | Attitude/ Belief | % V who believe they are able to take actions in the market to increase safety of food they sell |
| Salience                        | Attitude/ Belief | % V who believe that the safety of the food they sell affects the success of their business      |
| Locus of control/ self-efficacy | Attitude/ Belief | % V who believe they have an important role in assuring food safety for the products they sell   |
| Vending practices               | Behavior         | % V who meet traditional market food safety guidelines   |
| Communications and Engagement   | Behavior         | % V who report engaging in conversations on food safety with market actors                       |
| Awareness/ Knowledge            | Knowledge        | % V who can name ways to increase the safety of food they sell                                   |

### 7.3. APPENDIX 3. INDICES AND SUB-INDICES

**Table A3** contains details about the methodology of each index and sub-index included in this assessment.

**Table A3.** Methodology of indices and sub-indices

| SUB-INDEX                        | METHODOLOGY   | MAX SCORE |
|----------------------------------|---|-----------|
| <b>FOOD SAFETY SALIENCE</b>      |   |           |
| Ranking                          | An 11-item list of food, shop, and vendor attributes (including “food safety”) was presented to the respondent. First, the respondent splits the list into those that were relatively more important and those that were relatively less important. Next, the respondent ranks each attribute. The sub-index score was computed as the total length of the list (11) minus the rank order of “food safety” (i.e., the number of items below “food safety” in the ranking) | 10        |
| Choice                           | An 8-item discrete choice experiment, with binary levels for 4 attributes. The sub-index score was computed as the number of choice sets in which the product with the “safety assured” attribute was selected  | 8         |
| <b>FOOD SAFETY SELF-EFFICACY</b> |   |           |
| Perceived Self-efficacy          | A brief questionnaire module consisting of 6-point Likert-type questions was administered. Likert responses were coded on a 1-6 scale for each question. Numeric values were summed across all questions to construct the sub-index score   | 54        |
| Locus of Control                 | A brief questionnaire module consisting of 6-point Likert-type questions was administered. Likert responses were coded on a 1-6 scale for each question. Numeric values were summed across all questions to construct the sub-index score   | 54        |
| <b>FOOD SAFETY KNOWLEDGE</b>     |   |           |
| Knowledge                        | A 16-item questionnaire module of True/False questions on food safety-related principles and concepts. The index score was computed as the number of correct answers.   | 16        |
| <b>FOOD SAFETY BEHAVIORS*</b>    |   |           |
| Communication                    | A brief questionnaire module consisting of 6-point Likert-type questions was administered, assessing the frequency of respondents’ communication about certain aspects of food safety. Likert responses were coded on a 1-6 scale for each question. Numeric values were summed across all questions to construct the sub-index   | 72        |
| Consumer Practices               | A brief questionnaire module consisting of 6-point Likert-type questions was administered to consumers, assessing the frequency   | 72        |

|                  |   |     |
|------------------|---|-----|
|                  | of performing certain food safety actions. Likert responses were coded on a 1-6 scale for each question. Numeric values were summed across all questions to construct the sub-index score   |     |
| Vendor Practices | A brief questionnaire module consisting of mixed Likert-type and Yes/No questions was administered to vendors, assessing the extent to which respondents performed certain food safety actions. Responses were coded on a 0-4 scale for each question. Numeric values were summed across all questions to construct the sub-index score   | 124 |
| Consumer Cue Use | After a warm-up exercise, respondents in the consumer group were shown a series of 7 images depicting shops with food items and vendors. For each image, respondents were asked to exhaustively list the things they see that would make them <i>want</i> and <i>not want</i> to purchase food from the shop. Responses were checked against a checklist of 14 <i>a-priori</i> specified food safety cues of interest to EatSafe. The sub-index score was computed as the number of cues from the checklist that were mentioned throughout the entire series of images (maximum 14). Each cue was only counted once. Each image was pre-screened by food safety professionals to ensure that each cue was represented sufficiently in the image series. | 14  |

*\*The behavior sub-indices utilize self-reported data, except the Consumer Cue Use sub-index.*

## 7.4. APPENDIX 4: INCLUSION AND EXCLUSION CRITERIA

**Table A4.** Inclusion and exclusion criteria, by group

| CONSUMERS  | VENDORS   |
|--|---|
| <b>INCLUSION CRITERIA</b>  |   |
| <ul style="list-style-type: none"> <li>• Be 18 years of age or above</li> <li>• Be able and willing to give informed consent;</li> <li>• Have primary or shared responsibility for purchasing food for their household;</li> <li>• Have primary or shared responsibility for preparing and cooking food for their household;</li> <li>• Shop at a target market at least once in the average month;</li> <li>• Purchase at least one EatSafe Key Commodity at a target market, and preferably three or more;</li> </ul>  | <ul style="list-style-type: none"> <li>• Be 18 years of age or above</li> <li>• Be able and willing to give informed consent</li> <li>• Selling food within the boundaries of the selected market;</li> <li>• The vendor or the business where the vendor works sells food at the market at least one day per week;</li> <li>• Selling at least one Key Commodity regularly (at least once per average week) in a target market;</li> <li>• Be a primary vendor in the shop or food vending business;</li> <li>• Having sold food at the selected market for at least 3 months</li> </ul>   |
| <b>EXCLUSION CRITERIA</b>  |   |
| <ul style="list-style-type: none"> <li>• Not being able to communicate verbally in English or Hausa</li> <li>• Not being willing to share contact information for follow-up</li> <li>• Being a vendor or hawker of street or ready to eat foods</li> <li>• Being a vendor or hawker selling outside the boundaries of the market or in other markets</li> <li>• Not willing to give informed consent</li> <li>• Be a food vendor at the target market;</li> <li>• Reselling part or all of the food purchased at the target market (not including buying some food for a neighbor or a relative);</li> <li>• Plan to move away or stop shopping at the market in the next two years;</li> <li>• Be a participant in the EatSafe Focused Ethnographic Study (FES);</li> <li>• Another member of the household that shares primary food shopping responsibilities is already enrolled in the survey (the person with primary responsibilities should be preferentially enrolled);</li> <li>• Being a vendor or hawker of street or RTE foods.</li> </ul> | <ul style="list-style-type: none"> <li>• Not being able to communicate verbally in English or Hausa</li> <li>• Not being willing to share contact information for follow-up</li> <li>• Not willing to give informed consent</li> <li>• Being a vendor or hawker of street or ready to eat foods</li> <li>• Planning to move far from the market or stop selling food at the market in the next two years;</li> <li>• Participation in the second phase of the FES (and vice versa: participation in this survey is an exclusion criterion for the second phase of the FES); participants in the FES Phase 1 can be considered eligible, if needed to reach the target sample size. This participation should be recorded in the survey and direct observation data;</li> <li>• Another vendor in the same food vending business is already enrolled in the survey (the person with primary responsibilities in the operation of the business should be preferentially enrolled);</li> <li>• The business sells only snacks or food that is not brought and consumed at home.</li> </ul> |

## 7.5. APPENDIX 5: INDEX VALUES DISAGGREGATED BY GENDER

**Table A5** combines results from the consumer and vendor cohorts to illustrate differences across gender.

**Table A5.** Gender differences, combined by consumer and vendor cohorts

| INDICATOR     | INDICIES                       | MALE |      |             | FEMALE |      |            |
|---------------|--------------------------------|------|------|-------------|--------|------|------------|
|               |                                | N    | MD   | MEAN (SD)   | N      | MD   | MEAN (SD)  |
| SALIENCE      | Composite ***                  | 413  | 66 % | 66 % (±19)  | 554    | 61 % | 61 % (±21) |
|               | Ranking ***                    | 417  | 73 % | 64 % (±25)  | 603    | 64 % | 59 % (±28) |
|               | Choice ***                     | 421  | 63 % | 67 % (±22)  | 578    | 50 % | 63 % (±23) |
| SELF-EFFICACY | Composite                      | 425  | 74 % | 72 % (±14)  | 627    | 73 % | 72 (±12)   |
|               | Perceived Self-Efficacy *      | 425  | 74 % | 72 % (±17)  | 627    | 78 % | 74 % (±15) |
|               | Locus of Control **            | 425  | 74 % | 72 % (±13)  | 627    | 70 % | 70 % (±12) |
| KNOWLEDGE     | Composite                      | 425  | 56 % | 53 % (±11)  | 627    | 56 % | 54 % (±11) |
| BEHAVIORS     | Composite                      | 425  | 43 % | 44 % (±13)  | 627    | 41 % | 44 % (±13) |
|               | Communication <sup>FS</sup> ** | 425  | 26 % | 31 % (±17)  | 627    | 29 % | 34 % (±18) |
|               | Consumer Practices***          | 316  | 44 % | 45 % (±19)  | 204    | 50 % | 51 % (±20) |
|               | Vendor Practices               | 109  | 51 % | 50 % (±8.3) | 423    | 48 % | 49 % (±10) |
|               | Use of FS Cues                 | 316  | 57 % | 60 % (±21)  | 204    | 57 % | 61 % (±18) |

Note: MD refers to median; SD refers to standard deviation; and FS refers to food safety.

Significance levels: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01