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“Our food may not be very safe, because now days everything uses chemicals:” Women’s Perceptions of Food Safety and Nutrition in Phnom Penh, Cambodia

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2012

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An abstract of

A thesis submitted to the Faculty of the
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Abstract

"***Our food may not be very safe, because now days everything uses chemicals:"*** **Women's Perceptions of Food Safety and Nutrition in Phnom Penh, Cambodia**

By Sydney Morgan Brown

Foodborne disease and malnutrition are critical public health issues in Cambodia but there is limited evidence on effective integrated food safety and nutrition interventions. This study was conducted as formative research for a market-based intervention that aims to improve the safety of animal-source foods sold in informal markets. The study objective was to determine women's perception of the risk of food safety and how it relates to diet, health and decision making. Twenty-four in-depth interviews with female caregivers of children under five in Phnom Penh, Cambodia were conducted and complimented with PhotoVoice, which allowed the women to photograph their meals and perceptions of food safety and nutrition to further discuss during a second interview. The 48 total interviews (24 in-depth interviews and 24 PhotoVoice interviews) were analyzed using MAXQDA. A primary food safety concern expressed by women was that chemicals in animal-source foods, fruits and vegetables may impact the health of their families by causing diarrhea and problems during pregnancy. This fear created a lack of trust in markets which influenced their food purchasing behaviors and strategies for making the food safer for their families. These mitigation strategies vary slightly among the women, but are important to be able to provide their families with what they define as safe meals. Interventions that wish to decrease rates of foodborne illness and increase animal source food consumption should also address the belief that the food system has been compromised by the addition of chemicals and pesticides.

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Contents

Chapter One: Introduction

Malnutrition globally is linked to increased rates of morbidity and mortality, particularly in children under 5 years of age[1]. The first 1000 days of life are particularly important, and an appropriate diet rich in diverse, nutrient-rich foods is crucial to brain development and cognition. Development in early childhood is also linked to stronger GDP later; children who are well-nourished are better able to focus in school and therefore have better educational outcomes, in addition to better health outcomes [2].

Although overnutrition is increasingly problematic for children in developing countries, malnutrition generally refers to undernutrition[3]. Undernutrition can take two forms: acute and chronic. Acute malnutrition (wasting) is determined by a weight-for-height of more than two standard deviations below WHO guidelines, while chronic malnutrition (stunting) in children is determined using height-for-age[3, 4]. Globally, about 155 million children are stunted, and malnutrition is a factor in about 45% of deaths in children under 5 [3]. Malnutrition is a major concern for children in Cambodia; according to the country's 2014 Demographic Health Survey [5], one-third of children under five are stunted. Stunting is a result of chronic malnutrition in early childhood. It can be compounded by micronutrient deficiencies, like iron, zinc, and vitamin A, all of which can be found in an ASF-rich diet [6]. In Cambodia, malnutrition in pregnant women and children under 5 is estimated to cost more than $266 million annually and stunting alone reduces economic output by $120 million [7].

Foodborne disease is a major health concern in Cambodia; in 2017, there were 27 reported foodborne disease outbreaks. The Joint External Evaluation on International Health Regulations (IHR) (2005) compliance found that Cambodia had a score of 2/5 on food safety, indicating limited capacity in preventing and responding to outbreaks of foodborne diseases[8].

Evidence suggests many of these outbreaks stem from informal, "wet" markets where many Cambodians buy their animal source food products, which are an important and healthy part of the local cuisine, particularly for children and women of reproductive age [9]. Although 1 in 10 people worldwide will fall ill each year from a foodborne illness, 40% of the deaths resulting from these illnesses will occur in children under 5[10, 11]. Foodborne illnesses in young children also contribute to a vicious cycle of malnutrition that can result in stunting. When a young child who is already struggling with malnutrition becomes sick, he loses additional nutrients, which are often not appropriately replaced. He is then playing catch-up, trying to regain what he has lost, until he gets another foodborne illness.

To address these problems, a multi-level research and intervention project called Safe Food, Fair Food for Cambodia proposes to first investigate the health and economic burden of foodborne disease in animal source food product value chains and then to pilot a market-based intervention. Studies from other countries suggest foodborne diseases often stem from animal source products, specifically, and these are an important part of the diet in Cambodia and are also crucial to nutrition in young children. Similar interventions have been successful in Kenya, Nigeria, and India[12]. This qualitative study is a part of the formative research for this project. In Cambodia, women are primarily responsible for feeding their families, particularly young children. Their insights and perceptions of nutrition and food safety are crucial to the success of an intervention but have not been investigated in this context. The aim is to use qualitative methods to understand women's perception of food safety and how those perceptions inform the nutrition of their families, particularly young children.

Chapter Two: Methods

Study Setting

The study was conducted in five districts of Phnom Penh, Cambodia, a city of 1.5 million and the capital of Cambodia.

Study Participants and Recruitment

Safe Food, Fair Food for Cambodia proposed to conduct a risk assessment by conducting an initial cross-sectional household survey in Phnom Penh. Two hundred households were selected based on stratified random sampling using city zones and income. This initial survey was conducted in April 2018. For the qualitative research described here, a sub-group of households were purposively chosen from this household survey if a child between 6 months and 5 years resided there and if the woman primarily responsible for the child's nutrition consented to participate. This could have been a mother or, in 6 cases, a grandmother. The research team interviewed twenty-six women in five districts of Phnom Penh.

Data Collection

Activities took place over an eight-month period. The first three months (May-August 2018) were dedicated to piloting the research tools and conducting in-depth interviews with 26 women in Phnom Penh, Cambodia. These interviews focused on nutritional habits and how these habits were affected by gender, age, pregnancy status, breastfeeding status, and illness. The interviews also asked questions about perceptions of food safety and food security. Food security questions were adapted and translated from US Agency for International Development (USAID) (See Annex 2) [13].

These initial, in-depth interviews were complemented by a PhotoVoice project, in which 24 of the women agreed to take photos of their food before preparation, food preparation, and meals for 2-3 days and participate in a follow-up interview about the photos, whose purpose was to show how women go about preparing food for their families, including the barriers to

preparing safe, healthy meals. This approach, as described by CC Wang[14], allows for additional engagement by the participants by enabling them to tell their own stories by taking photos of their lives. These photos and follow-up interviews added context to the central objective of the study.

All interviews were conducted in Khmer by research assistants from CelAgrid who were trained in qualitative methods. All interviews were recorded and one of the two research assistants present additionally served as a note-taker to add context. Two recorded files were corrupted and unusable, and two women declined to participate in the PhotoVoice interview, resulting in 48 interviews (24 initial in-depth interviews and 24 follow-up PhotoVoice interviews with the same women).

Data Analysis

Preliminary data analysis occurred during data collection with the research team. At the end of each day of data collection, the project coordinator debriefed the research assistants. Preliminary themes emerged from these debriefs and notes taken at each interview.

Audio recordings were made of all interviews with the participants' permission. They were then transcribed verbatim in local language and then translated into English.

All data from the initial in-depth interviews and the follow-up Photo Voice interviews was entered into MAXQDA for analysis. Photos were tracked and matched to the corresponding section of text in the interviews.

Data were analyzed for deductive themes defined *a priori.* Inductive themes emerging from the data were also be noted and coded. A draft codebook was developed and continuously updated and revised.

Responses from the adapted food security questionnaire were analyzed following guidance from the USAID [13]. Each participant's answers were assigned a score based on how frequently they experienced a condition, if at all. These scores are described as secure (0-1); mild food insecurity (2-5); moderate food insecurity (6-8); and severe food insecurity (9+). The results of the food security questionnaire can be seen in table 1.

Ethics Approval

The study was approved by the National Ethic Committee for Health Research, (300NECHR) and the Emory University Institutional Review Board (#IRB0010343). All women who participated gave informed verbal consent for each interview and approved the use of photos in publications related to the project.

Chapter Three: Results

Participants resided in 5 districts around Phnom Penh. Six grandmothers were interviewed. The other twenty participants were mothers (see table 1). The youngest child in the home was, on average, 24.7 months old (range: 7-48 months). The average number of children residing in the home was 2.45 (range: 1-10).

Eleven women reported working in some fashion. Only one grandmother reported working; generally, grandmothers were caretakers in situations where the mother worked outside the home, either in construction or in a factory. Reported worked activities included selling flowers, having a shop in or near the home, and sewing clothes for a factory.

Table 1:

Participant Demographics (n=24)

Relationship to child	
Grandmother	25%
Mother	75%
Working	
Yes	46%
No	54%
District	
Sba Ampov	25%
Chroy Chong Va	21%
Sen Sok	17%
Moan Chey	17%
Po Sen Chey	21%
Level of Food Insecurity	
Secure	21%
Mild	29%
Moderate	21%
Severe	29%

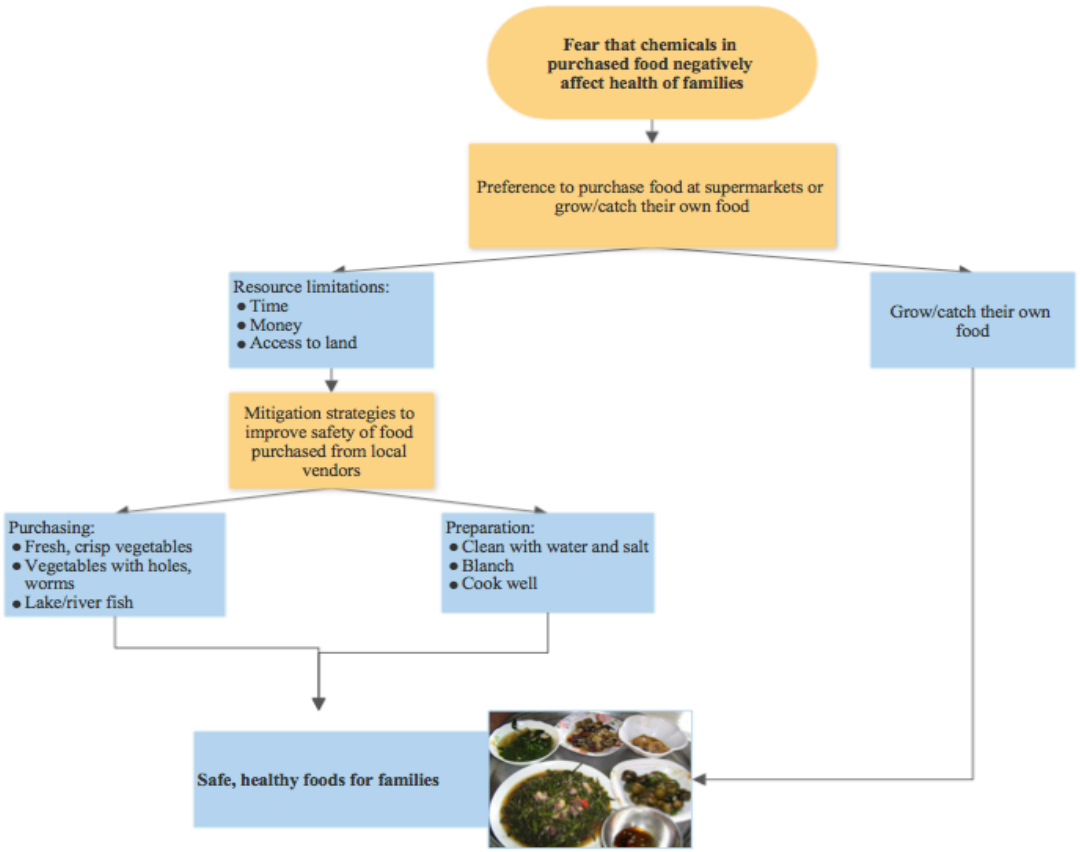
The interview asked participants' perceptions and opinions on several aspects of nutrition, including their family's nutrition habits; how habits change during pregnancy and breastfeeding; how nutrition changes between men and women and boys and girls; and the women's perceptions of food safety. Food security level was examined as a variable using comparative analysis, but this did not appear to affect women's perceptions of food safety.

Although the focus of the research and eventual intervention is on causes of foodborne illnesses such as salmonella, e. coli, and other infections, the women did not discuss this. Overwhelmingly, they focused on chemical contaminants such as pesticides as a risk to food safety. Within this primary theme, several sub-themes emerged that, together, offer a nuanced look at how the participants perceive food safety, the barriers to safer foods, and the strategies

they use to mitigate the risks they associate with eating food contaminated with pesticides and other chemicals.

Conceptual Model

The combination of these individual themes can be conceptualized as a decision tree. Figure 1 visually depicts the decision process women go through to try to feed their families safe, nutritious meals. Their fear of chemicals in the food chain leads them to prefer to either purchase food from a fancy supermarket or grow or catch their own food. Ideally, women would prefer to grow their own vegetables, catch their own fish, and raise their own chickens and pork. Many women do grow some of their own vegetables and herbs and were confident that these were not contaminated with pesticides.



Although they feel there are safe, existing options to obtain safe food, the women identified several resource limitations that prevent them from being able to purchase food at supermarkets or grow and catch their own food. These limitations were time, money, and access to land. The women felt that they did not have the time to dedicate to the amount of gardening, animal-raising, and fishing it would take to provide food for their families. Supermarkets are also located far from their homes, making them difficult to access in addition to being very expensive. Many do not have the space to dedicate to a large garden or many animals.

Instead of purchasing their foods at supermarkets or growing or catching their food, they purchase most of their family's food at the informal markets and instead use a variety of mitigation strategies to make the food safer. These purchasing and cleaning strategies are discussed in detail above.

The participants consistently demonstrated that a great deal of thought goes into each part of the decision-making process.

Themes

Importance of Family Meals

Women took pictures of a variety of things over the three days. Many took photos of their food and food preparation, but when asked what their favorite photo was, the women who took a photo of their family eating together chose that photo. They put a great deal of importance on family meals and providing healthy meals for their entire family. Their concerns are for their children and their husbands and they reference their family members frequently.

Figure 2: "The photo that my family is altogether, there is the husband and wife and everyone. The photo when we have a meal together."

Figure 1: "That one is important. Because we were having meal together."

Additionally, family preferences were paramount to what women decided to purchase at the market. When asked how they decide what they will purchase, women overwhelmingly reported that they relied on family input and preferences, but regardless, they go through many stages in deciding exactly what items they will provide, why, and how, before putting a meal before their families. The traditional Cambodian diet is made up of rice, served at nearly every meal, and a large variety of flavorful soups and stewed meats, fish, and vegetables to compliment the rice. As shown in the photographs, taken by the participants, families usually eat together on the floor. Each family member has their own small bowl, which they will fill from the common bowls of stews, soups, and rice in the center of the circle.

Chemicals Affecting Food

"Our concern is nothing besides sickness. Because the things we buy from the market might not be clean enough. We worry about getting fever, diarrhea and so on."

All women discussed chemicals and/or pesticides (words used interchangeably) affecting their food, particularly food purchased from the market. Many specified vegetables, including lettuce, Chinese kale, chives, lemongrass, cucumbers, and morning glory, as being of particular concern. Meats, however, were not exempt; multiple women referenced pork and chicken being

contaminated with chemicals as well. For example, one woman explained, “Because nowadays there are many chemical injected meats. Such as few days ago, I bought half a kilogram of pork. It smelled very bad and I got a little sick at that time. I then tried to marinate it and dried it under the sun; however, it still had a bad smell. The smell was getting worse as I cooked it. That’s why I abstain from pork. I won’t buy those meats anymore since then.” While fresh foods were discussed most frequently, some women did discuss the chemicals in processed foods and drinks, as well.

The women feel that in the markets, the chemicals are difficult to avoid. “They have chemicals. Now, even vegetables have chemicals, meat has chemicals, farmed fish,” said one woman. Another said, “But I know most foods sold now are mostly exposed to chemicals. … They mostly use chemicals. But we can’t escape from it. That’s why we don’t eat vegetables often as before.”

It is commonly believed that these chemicals cause illness. Those who did describe how the chemicals affected their families generally referenced diarrhea or general food poisoning, generally very quickly. One woman says about her husband, “If any vegetables use too many chemicals, the stomachache occurs immediately when eating. Especially my husband, it is very fast, when he eats, if they put a lot of chemicals he will surely get diarrhea.”

Pregnant women and their fetuses are at particular risk. “First, I’m afraid that it will affect the baby because of those chemicals in the vegetables. It is okay for us to eat them but the baby in the womb cannot handle all those chemicals that they receive from us,” explained one participant. This belief carried through to children after birth, as well. Natural foods (or food that were not produced using chemicals) are seen as beneficial to the health of infants and children,

as explained by one woman: “When each of my children and grandchildren are born, I rarely let them eat snacks, I don’t let them eat them, so the baby is healthy because of natural vegetables.”

Many women related their perceptions about the chemicals of the food to cleanliness, as can be seen in the introductory quote: “Our concern is nothing besides sickness. Because the things we buy from the market might not be clean enough. We worry about getting fever, diarrhea and so on.”

This perception seems to be interwoven into many of their mitigation strategies, as well.

Home Grown as Safe

“They are all not safe. If we want organic vegetables, we have to plant by ourselves. Even morning glory also has chemical in it. I wanted to have Chinese kale, chive, choy sum, so I bought a pack of fertilizer and planted those on my land. It will be safe.”

Figure 3: "I want to show that natural vegetables are hygienic and good for health. We should plant those vegetables such as banana tree, ivy gourd....by ourselves are better than buying from the market."

The women state that it is the farmers who use the chemicals. There seemed to be a disconnect between various parts of the food chain; the women feel farmers are responsible for using chemicals, and do not trust the vendors unless they personally know them, as was the case for several women. The one common solution was to simply remove the family from the supply chain altogether. Women who purchased all the food the family ate expressed a desire to be able to grow their own vegetables, while women whose families relied in part on food that was either grown on the family’s land, caught by someone in the family (fish), or raised by the family (chickens or pigs) expressed confidence that this food was safer because it was free of chemicals. Several also described food that is not grown or raised using chemicals as natural—and that is preferable for the health of their families.

Multiple women said that that Cambodian farmers use chemicals, but that the foods coming from Vietnam are worse. “They say that the products imported from Vietnam use more chemicals than we do here. They use them a lot.” They also express discomfort with the imported packaged foods, particularly sugary snacks aimed at children. Again, however, it is the chemicals and their perceived effect on the health that scares the women: “There are too many imported products. Like ice cream, packaged-snacks nowadays, cause cough and fever. I don’t know why they make those products, their tastes are attracted to the children. But all of them are causing cough. If not fever, it is cough, those two. Likewise, the ‘Samurai’ (a local soft drink) and other flavored drinks. Too many of them.”

Both the desire to grow or catch their own food or the feelings about imported food being worse seem to revolve around trust. “We won’t know unless we grow them ourselves. We can’t know if they grow them. It’s better to eat what we have like luffas, papayas, morning glory, that we use cow and chicken manure on.” This also comes out when women do talk about purchasing items at the market. There are some sellers at the market that they trust because they know them. “There’s a man who pick stuff from the farms. We buy those because they’re safer,” explained one woman. Others said they purchase from their neighbors and feel safer because the women know each other.

Whether they grow or catch the food themselves or purchase it, the women prefer for the food to be grown naturally.

Purchasing Strategies

“See if they’re natural. If they’re farmed fish, I only buy when I really need to, but just a small amount. If I go to the market and see slat fish, I’ll buy them if they look free of chemicals. But we’re still not sure if there are more or less chemicals.”

As described above, the women interviewed suggested that growing and catching their own food would be preferable to purchasing it at markets, which they universally feel are sources of unsafe, chemical-laced food. Alternatively, they would prefer to purchase food at natural-food stores: “I heard that they are mostly at the natural or organic vegetable stores. I heard that there are a lot in Phnom Penh.” However, having the land and resources to be able to exclusively grow their own food is expensive, and because the cost of these natural stores in the wealthier areas of Phnom Penh are so expensive, the women cannot access these alternatives regularly. Because of these barriers, they instead resort to a variety of mitigation strategies. These can be grouped into two sub-themes: purchasing strategies and cleaning strategies. In each, the strategies themselves are diverse, but the existence of a strategy with the specific goal of limiting the exposure to chemicals was consistent.

In markets, some women stated that they prefer to buy the vegetables that do have bruises or evidence of worm damage because that suggests that pesticides were not used, or that they were not used as much. One woman said, “I buy the better-looking ones. For vegetables, if they don’t look good, I don’t buy them. ... (pause) ... But look at the goodness, if they look too good, I don’t buy it too. If there’s some caterpillar or something, we can wash them more. Those don’t have too many chemicals.”

However, others intentionally select the cleanest, freshest looking vegetables. They avoid bruised vegetables, those with holes or other signs of damage, particularly by insects, and focus on color. These women, however, did not seem to see this as an indicator that the food was not contaminated with chemicals—just that they purchased them anyway. “I choose the fresh vegetables…no caterpillars. I don’t know if they have chemicals, as long as they look good.”

Flies, however, are consistently labeled as unhygienic.

Opinions on refrigeration were also varied. Some women insisted that they only purchase things that had been refrigerated and that they would refrigerate in their homes to kill viruses on the food, and that refrigeration was what made supermarkets a safer option for purchasing food, while others suggested that supermarkets may also use chemicals to extend the life of food beyond its natural state and was, therefore, also problematic: "I think supermarkets are more likely. But I am also afraid that they store the products for too long. So, they would use some medicine (preservative/chemicals) to keep those products fresh."

Some of the women referenced the geographic source of the vegetables in their decision-making. Food imported from Vietnam was seen as more dangerous, and also unavoidable. "That right. Mostly, they said that the products imported from Vietnam use more chemicals than we are here. They use them a lot," said one woman.

Money was also a major factor in purchasing decisions. While a food security questionnaire was included at the end of the in-depth interview, the responses did not seem to impact women's opinions on food safety or barriers to safer food. They choose one market over another because of the overall cost. "Here, they sell for 12,000 Riels ($3) but at the market, they sell for 10,000 Riels ($2.50) or so. It's about two thousand 2,000 Riels ($0.50) difference. So, I can save some money by going to the market so that I can buy additional groceries and stuff," said one woman. However, for other women, the cost of getting to a market is prohibitive, so they purchase food from their neighbors or mobile vendors, even if the food may be more expensive.

Although their desire is to feed their families safe, healthy food, money often decides what they can ultimately purchase. They feel that safe food does exist in the country, at organic shops, but that food is more expensive and further away.

Cleaning Strategies

"Blanch to get rid of that stuff. I even clean it for three or four times. I soak it to eliminate the contaminated substances. I am afraid that they are exposed or are injected with chemicals. I'm afraid that it would cause diarrhea when eaten."

Each of the women interviewed also had a cleaning routine involving some combination of washing the items multiple times, usually with salt, blanching (briefly putting the product in boiling water), and then cooking well to get rid of harmful chemicals. "If we buy beef and stuff from the market, like I said a few times already, we need to wash it two to three, four, five times or so then soak it ten minutes or so and wash them and rinse them dry. Make sure the water's well boiled then soak again before cooking."

Because they feel that there is no way to fully avoid purchasing food items contaminated by chemicals, they rely on their cleaning strategies at home to make sure they provide their families with the healthiest meals possible. One woman explained, "We don't know what to do. It's no choice. We can't get if we don't buy it. The meat at the market is never good. The pork now uses the chemicals, so does the chicken. We can't avoid it, then just buy it and boil water to blanch it."

Figure 4: "Lettuces and tomatoes, I use normal water. We just rinse the pesticide and soak them for a while then clean them and put them in a basket."

This was also true for vegetables, although there were slight differences by vegetable.

Source of Beliefs

Very few women gave specifics about the sources of their beliefs about chemicals contaminating all of the food or how they believe their families react to these chemicals. Several did say that they'd "heard" of one thing or another happening from a friend or family member.

This was common when discussing the chemicals in the food, but also when discussing why they purchased or cleaned certain items the way they did. Husbands and mothers were most commonly referenced in these instances.

Two women mentioned Facebook, but only one specified further, saying, “Mostly the concern [with pork and beef] is the post from Facebook, the pus in pork and beef.” The researchers did not see the video.

Another woman did not mention Facebook, but did say, “I suggest using natural ingredients, only do as much as we can, no need to use chemicals. It means cucumber at night is small, tomorrow when bright, reaching this hand span.” During the daily debrief session, the research assistants showed a video that has circulated on Facebook in the area that appears to show farmers injecting a cucumber with something to make it grow quickly.

Chapter Four: Discussion

This study qualitatively explored women’s perceptions of nutrition and food safety. The use of PhotoVoice adds additional nuance to the women’s statements, particularly on the importance of cleaning their food and their preferences for food free of chemicals. The decisions women must make in order to feed their families is extremely important to the nutrition of their families, particularly of children. They feel that the chemicals and pesticides used during the production of their food (both animal source food products and fruits and vegetables) negatively impact the health of their families, causing ailments such as cough, fever, and diarrhea, and even negatively impacting the health of a fetus if the mother eats contaminated foods during pregnancy. Because of the barriers to accessing food free of chemicals, they instead use various mitigation strategies both when they purchase and when they prepare foods in an effort to reduce chemicals in the meals they feed their families.

Ultimately, when women discussed their feelings on the safety of their food, they brought up concerns about the perceived risk from chemicals (and notably not foodborne disease from pathogens) and how that informed their food choices and behavior. Research conducted in the United States suggested that a variety of factors contribute to how people ultimately choose what to eat, including cost, quality, and convenience [15]. This is not dissimilar from our findings; cost and convenience are barriers to accessing safer (higher quality) foods. Bailey, et al, used this model to explore food choices in Delhi, India, while Daivadanum, et al, examined this in Kerala, India. [16, 17]. This research documented the importance of family preference (particularly the husband's preference) on how families decide what to eat, like in Cambodia. Time and money are documented as important factors in all locations, but they function differently in Cambodia. While in the studies conducted in India and in the United States, money and time play into what people purchase to eat, in Cambodia, these factors are barriers to accessing safe food at all.

Much of the documented research on food choice focuses on affordability and healthy food choices. An emerging trend in low- and middle-income countries (LMICs) is the gravitation toward packaged foods, low in nutrients and high in sugar and refined carbohydrates[3, 18]. This trend has contributed to an increase in cardiovascular disease (CVD) in many low- and middle-income countries [3, 18]. The women in our study seem to recognize that these options are not healthier and would prefer to feed their families fresh vegetables, fish, meat, and locally-grown rice, however several did discuss how available these foods were and how they affected the acute health of their children; they associate chemicals with incidence of cough, fever, and diarrhea.

Trust was an important factor in Cambodia for women deciding what to purchase. If they do not trust that the products are safe, they will try to avoid them. This could negatively impact the nutrition of their families, particularly when the foods they are avoiding are so critical to the nutrition of infants and young children, like meat, fish, and vegetables. Although studies

focusing on the trust of consumers in vendors have not been undertaken in Cambodia, the country report for Cambodia from Consumers International did explore the regulatory framework that exists in Cambodia to protect consumers, including exploring how consumers themselves feel about the framework [19]. Regulations to protect consumers are nearly non-existent in Cambodia, and so faith in the system is extremely limited. The report also found that consumers worry most about the chemicals in their food [19], despite experts being concerned with more biological hazards [20]. It is important to acknowledge the psychology of risk perception, but little research has been conducted in the developing world. This study adds to the evidence that people are more distrustful of things like large companies, 'unnatural' process, and uncertainly over unfamiliar dangers [21]. The women are afraid of illness coming from food but believe that this sickness comes from chemicals used by distant farmers, including those in foreign countries. Their desire to grow their own food and firm belief that they can only be certain that it does not have chemicals if they grow it suggests some of the fear stems from both the unknown and the uncontrollable.

To improve the nutritional status of children in Cambodia, it is important to examine each level of this decision-making process and for future interventions to address possible misconceptions effectively. If women feel that the food at the market is contaminated with chemicals, they may avoid it altogether, which may reduce the diversity of the diet they feed their children. Additionally, their mitigation strategies during preparation may in fact reduce the nutrients present in the foods they purchase; overcooking food can reduce the nutritional content of the food.

The source of these beliefs is also important to consider. Although our study did not explore the source of these beliefs in great detail, a few women brought up Facebook videos that appear to show chemicals used in food production. This, complimented by the importance of

trust in the opinions of family members and the trust they place in certain vendors, suggests that grassroots level communication and relationship-building will be important in any intervention strategy.

Limitations

Our study group did not systematically collect information on the source of the family's income, which could play a role in the decision-making process. We also did not conduct interviews with market vendors or farmers, many of whom are women who are also responsible for feeding their families. Their perceptions may be different from the women who participated in this study. The strengths of the study include verbatim transcription of all interviews; interviewing each participant twice, which allowed for the addition of photos and further reflection on how the women perceive their food; and the continuous involvement of local research partners who were familiar with the local context.

Conclusions

When asked for recommendations about the health of their communities, many women said they would like farmers to stop using chemicals in the food because it makes their families sick. This perception is an important take-away from this study, as it is a key driver of food purchase decision-making and household food consumption. The women believe the chemicals are there and affecting their health, and this study provides insight that will be helpful to address in the development of an intervention, including communication networks and tools that are contextually appropriate to the population. Further research on the influence of social media could add insight on the reasons behind the women's feelings. A planned intervention may investigate further how they can incorporate women's perceptions of food safety into their program.

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Appendix 1: In-Depth Interview Guide

Objective: To determine mother's perception and influence of diet and food habits in the family surrounding the provision and use of animal sourced food products.

Population: mothers with a child between 6 months and 2 years old

--If mother is not the person primarily responsible for meals, speak to the person that is.

After you have read the full consent form and she has given consent:

I would like to thank you for meeting with me today and sparing your time. My name is <your name> and this is <note-taker> and we are both part of a Project Team with CelAgrid, ILRI and Emory University in the United States of America. By speaking with you today, we are hoping to learn more about nutrition and food safety in this community. As a mother we know you have a great deal of experience and there is much we can learn from you. The knowledge you share with us will help to improve our nutrition and food safety programs.

I would like to point out that there are no right or wrong answers. We are interested in your views, so please feel comfortable to say what you honestly feel.

The session should take approximately 1 hour. Do you have any questions before we begin?

Introduction:

1. First, can you tell me about your family?
    a. How many people live in your household? Are they all members of your family?
    b. How many children do you have? Boys/girls? What are their ages?

General Family Nutrition: *Great, now I have some questions about food habits in your family.*

2. Could you talk about a typical day and describe what foods are prepared, cooked and served in your family and when?
    a. What do you and your family eat in the morning?
    b. What do you and your family eat at midday?
    c. What do you and your family eat in the evening?
    d. What do you and your family eat between meals?
    e. Does this include foods eaten outside the home? Please tell me about those.

3. How are these habits different in other parts of your community?
    a. How does this vary by religion or income group?

4. Who typically prepares, cooks, and serves the food in your family?

5. Please tell me about where you get your food.

    a. Who purchases the food? From where? Why do you purchase food at that place?
    b. How do you decide which food to purchase? Animal source foods?

6. Do you and others in your family feel that the food they purchase is safe? Why or why not?
    a. What about animal source foods?
    b. If not, where would you prefer to obtain your food?
    c. What do you do/can you do to improve the safety of your food?

7. How do the types of food your family eats change depending on the season?
    a. Why? Please give examples.

8. How does the amount of food your family eats change depending on what time of year it is?
    a. Why? Please give examples.

9. Are there certain foods or drinks only women, children, or men eat? Why?

10. Are there certain foods you or people in your family do not eat? Why?
    a. Animal source foods?

11. Tell me about the differences in how boys and girls eat.
    a. At what age do boys and girls start eating? When do they begin eating animal source foods?

12. Tell me about the differences in how men and women eat.

Maternal Nutrition

13. What are the important food items a woman should eat while she is pregnant? Why are those foods important?
    a. Are there any barriers to obtain/eat these foods?
        i. If yes, why?
    b. Do pregnant women eat a different amount of food than others in your family?
        i. If yes, why?

14. How do breastfeeding women in your family eat?

15. Are there foods pregnant or breastfeeding women should avoid?

Nutrition Influence:

16. Who generally decides what your family eats? Why?

17. How is food distributed in your family?
    a. Is there an order in which family members sit for a meal?
    b. Does the family eat together? Who eats first?
    c. Does this change when there is a pregnant woman in the family?
        i. Do they become prioritized or not?

Illness

18. Have you or anyone else in your family been sick in the past month?

a. What were the symptoms?
b. How did you or your family member eat during this time? What did you/they eat?
c. Did you see a health care provider?

Conclusion

19. What are your biggest concerns regarding health and nutrition in your family?
    a. In your community?

20. What are some recommendations you have to improve the health and nutrition in your family?
    a. In your community?

21. Do you have any questions for us?

Thank you for your time today! We greatly appreciate you speaking with us today.

(Move on to Food Security Questionnaire)

Appendix 2: Food Security Questionnaire

No	Question	Response Options	Code
1.	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Y es	....|___|
1.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	....|___|
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Y es	....|___|
2.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	....|___|
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes	....|___|
3.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks)	....|___|

		2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No (skip to Q5) 1 = Yes	....|___|

4.a	How often did this happen?		
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	....|___|
5.a	How often did this happen?	0 = No (skip to Q6) 1 = Yes	....|___|
6.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	....|___|
6.a	How often did this happen?	0 = No (skip to Q7) 1 = Yes	....|___|
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	1 = Rarely (once or twice in the past four weeks)	....|___|

		2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
7.a	How often did this happen?	0 = No (skip to Q8) 1 = Yes	....|___|
		1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	....|___|

8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes	....|___|
8.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	....|___|
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1 = Yes	....|___|
9.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks)	

		3 = Often (more than ten times in the past four weeks)	

Appendix 3: Photo Voice Interview Guide

Introduction:

Now, if you are interested, I will loan you this camera for two days. I would like you to take photos of what influences how you feed your family. This can be food before you prepare it, food as you prepare it, meals, food you purchase, or even markets. I will show you how to use the camera and we will practice taking a couple photos together, so I can make sure you know how to use it. We would like you to take about 30 photos over the next two days, but it is okay if you take less. On _____ (day), I will come back and we will talk about the photos.

You have a choice about how we use these photos. You do not have to consent to us using the photos in our report. If you do consent, you can either consent to us using the photos only in our final report for the researchers, or to allow the photos to be published. You can participate regardless of your decision.

If you take photos that include people, like you and your family, we can hide their identities if you want us to.

Camera instructions:

☐ Give her the camera and explain how to take a photograph.

☐ Have the mother take some pictures with the test camera so that you're sure she knows how it works.

Central topic to take pictures of:

What are the influences on the way you feed your family?

People, Places (Market), Pre-cooked food, Cooking, Meals

Interview questions:

1. What does the central question mean to you?
2. What are some answers to the question- think of people, places, things, food, self.

Remind the mother that she should take all 30 photos in 2-3 days. Date: _____

Photo Voice follow up interview, visit 2

Thank you for your participation in this study. Remember, you don't have to talk about anything you don't want to and you may end the interview at any time.

Is it okay if we use these photos in our final report? Is it okay if we use these photos in other published materials?

(CIRCLE ONE):

- Do not use photos
- Final report only
- Published materials

Okay, can I record our conversation today?

(If she agrees, start the tape recorder AFTER the introductions part of the discussion. This guide includes the topics to be covered and questions that may be helpful in facilitating the interview.)

Materials: camera, extra batteries, voice recorder, notebook, pen

Interview Questions: (make sure recorder is on)

1. Please describe this photo #X (go through all of them). **Say the number aloud.**
2. Why did you take a picture of it?

Probes about things not in the pictures:

3. Are there other people who influence how you and your family eat that you didn't have a chance/couldn't take a photo of?
4. Do you or your family eat in different places that you couldn't photograph?
5. Are there certain foods that influence how you feed your family but that you couldn't take a picture of?
6. IF there were no pictures of this: Does your own health influence how you feed your family?
7. Were there foods that you did not purchase/photograph because you were afraid of illness?
8. Overall, what did you think of this photography activity? Why?
9. Do you feed your family the way you think is best? Why or why not?
10. Which photos are most important?

Appendix 4: Consent Forms

Please note this is a guide that research assistants will use to obtain oral consent from participants. Given the low literacy rate in this community, research assistants who speak the local language will read the consent form to the participants and will take time to ensure understanding before proceeding. Staff and IRB contact information will be given to participants so they may contact them for any additional questions.

Title: Nutrition and Food Safety in Phnom Penh, Cambodia

Principal Investigators: = Sydney Morgan Brown, Emory University; Melissa Young, Emory University; Hung Nguyen, ILRI; Chhay Ty, CelAgrid

Introduction

Hello, my name is (***interviewer***) and I am working with Emory University and the International Livestock Research Institute. I am working on a study that is trying to assess current nutritional practices among mothers and young children in Phnom Penh. You are being asked to participate in this study because you have a child 6-23 months and your experiences with caring for and feeding your children will be extremely helpful to understand this topic. Today we would like to talk with you about your experiences with obtaining food for feeding yourself and your young children. This consent form will give you information about why this study is being done and what you will need to do to participate. It is entirely your choice to participate. If you decide to take part, you can change your mind later on and withdraw or skip questions you do not wish to answer at any time.

Do you have any questions or comments before we proceed?

[Interviewer: Address any questions, and explain that first you want to make sure they understand the study and what is being asked of the participant. Encourage the participant to ask questions as you proceed]

This interview should last approximately one hour.

Why is this study being done?

The purpose of the research is to understand current nutritional practices among mothers and young children; to understand how you feel about food safety, and to identify barriers preventing children and mothers from accessing safe animal source food products.

What will I be asked to do?

If you agree to participate in this study, you will be asked to share your opinions and experiences about feeding your child. We will talk to you for about one to two hours then ask you to take

some pictures over three days of your food preparation and meals. We will visit with you again after 3 to 4 days to discuss the photos you've taken. Each of these meetings will last 1 or 2 hours. If you do agree to share your experiences, all information will be used without mentioning your name. However, for practical reasons, we would like to record the discussion to help capture all the ideas expressed.

In the second interview, we will discuss each of the photos you've taken with you. They may be used in the research paper or in other resource materials after the study. If you don't want us to use any of them, or only want us to use some of them, please tell us. We will ask you about each photo when we look at the photos with you.

Benefits and Costs of the Study

You may not get any direct benefits from this study. However, we hope that the findings from this study may benefit your community to improve access to safe food. There are no costs for you to participate in this study.

Risks or Inconvenience from Participation

There are no known risks from your participation in this study. However, one inconvenience could be the time it takes to complete the interview.

How will my personal information be protected?

The information you provide will be kept strictly confidential and names will be de-identified from reports. All the recordings will be kept in a secure place where only those from the research team can access these.

Participation in this interview is voluntary and you may refuse to answer any questions or to finish the survey. There are no penalties or consequences of any kind if you decide that you do not want to participate. You do not have to answer any question that you do not want to answer.

Your honest response will be critical to improving the development of locally appropriate and acceptable ways of improving access to safe food in Phnom Penh.

Do you have any further questions about this study?

ANSWER QUESTIONS

If you have additional questions or concerns or in the case of an emergency, please contact the following:

Name	Hung Nguyen	Morgan Brown
Mobile	+84 4 3237 3995	(Local Phone Number)
Email	h.nguyen@cgiar.org	Sydney.morgan.brown@emory.edu

If you have questions about your rights as a research participant or if you have questions, concerns or complaints about the research, please contact any of the following:

1. Safe Food, Fair Food for Cambodia,
2. Emory Institutional Review Board at 001- 404-712-0720 or email at irb@emory.edu

During the discussion, <note-taker> will be keeping notes to keep track of the discussion. So we don't miss anything we would also like to record this interview. The recording will be safely stored and nobody outside the research team will have access to the recording. May I record this interview? You may stop the recording at any time during the interview if needed. May we begin?

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