

Preliminary Survey Tool Measuring Childhood Lead Poisoning through Spice and Home Remedy Exposure in North Carolina

Master of Public Health Capstone Project
and Field Experience Presentation

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Presentation Overview

- Field Experience
- Introduction
- Project Overview
- Background
- Regulations, Consumption, and Importation
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Field Experience Introduction

- Performed in the Childhood Lead Prevention Program
- Preceptor: Public Health Epidemiologist Kim Gaetz, PhD, MPH
- Applied principles of public health knowledge to implement a pilot survey
- Collected appropriate data to build a focus group to conduct Master's project



<https://www.cdc.gov/nceh/lead/nlpr/w.htm>

Project Overview

- Dr. Gaetz maintains the Children Lead Surveillance System across the entire state in a database called “NCLEAD”
- My project developed from a conversation with the FDA who contend that children are not being exposed to enough spices and home remedies to cause lead poisoning

Learning Objectives

- Fine tune and improve a food intake survey for REHS to conduct at home visits
- Collect and organize appropriate data to build a focus group
- Apply principles of public health knowledge to implement the pilot survey
- Work integrally in a team of public health professionals
- Communicate efficiently with others in order to achieve section goals

Activities To Be Performed

- Prepare a focus group guide in conjunction with local health professional
- Identify a focused population
- Apply survey to the focused population
- Evaluate data to communication barriers, issues with survey administration, and potential survey improvements

Anticipated Products

- Produce a successful preliminary survey that can be used to gather information to conduct a larger scaled survey
- Create a professional network of individuals looking to create a difference in the community
- Develop and implement the knowledge and skills I have learned at Kansas State University

Background

- Spices are specific parts of a variety of tropical plant species—generally the product of the flower, fruit, seed, bark, or root¹
- Spices bring together a sense of identity that enrich lives and bring people together

**2014 Total Population
vs. Spice Consumption
(millions)**

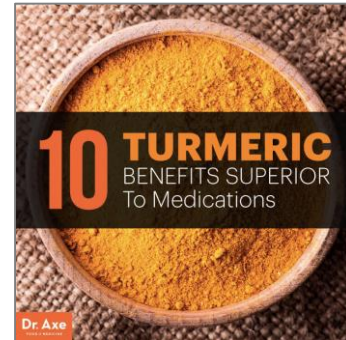


■ Total US Population

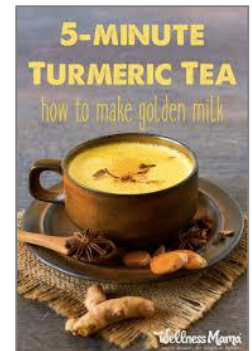
■ Total Spice Consumption

Background

- Trends for the use of alternative, homeopathic medicine are also on the rise
 - Termed “Ayurveda” or “Ayurvedic”
 - Phytochemicals promote healing and preventative roles in chronic diseases⁴
 - Not required to meet standard safety regulations to which conventional medicine must adhere
 - In 2008, a National Institute of Health study found 21% of 193 products purchased and manufactured either in the United States or India had high metal toxicity, including lead⁴



<https://draxe.com/wp-content/uploads/2014/03/TurmericBenefitsArticleMe me.jpg>



https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcQPUjFBajxnG-kUnCtd-PQ4O1Khgyr1UB_ArRbbOJd6d5JowJ19AA

Case Incidence

Timeline of Events

Index Case: 2009,
a child consumed
chamomile
tested through
IC-MS at 0.65
ppm of lead

2010, ICP-MS
machine granted
to the N.C. State
Laboratory,
isolates
micrograms of
lead

From 2010-2016,
CLPP
documenting
isolated cases
across the state

April 2016, CLPP
had a conference
call with the FDA
Atlanta District
Office

2016-Present,
Emphasis placed
on training REHS
and more
accurate
reporting/record
keeping

Case Incidence

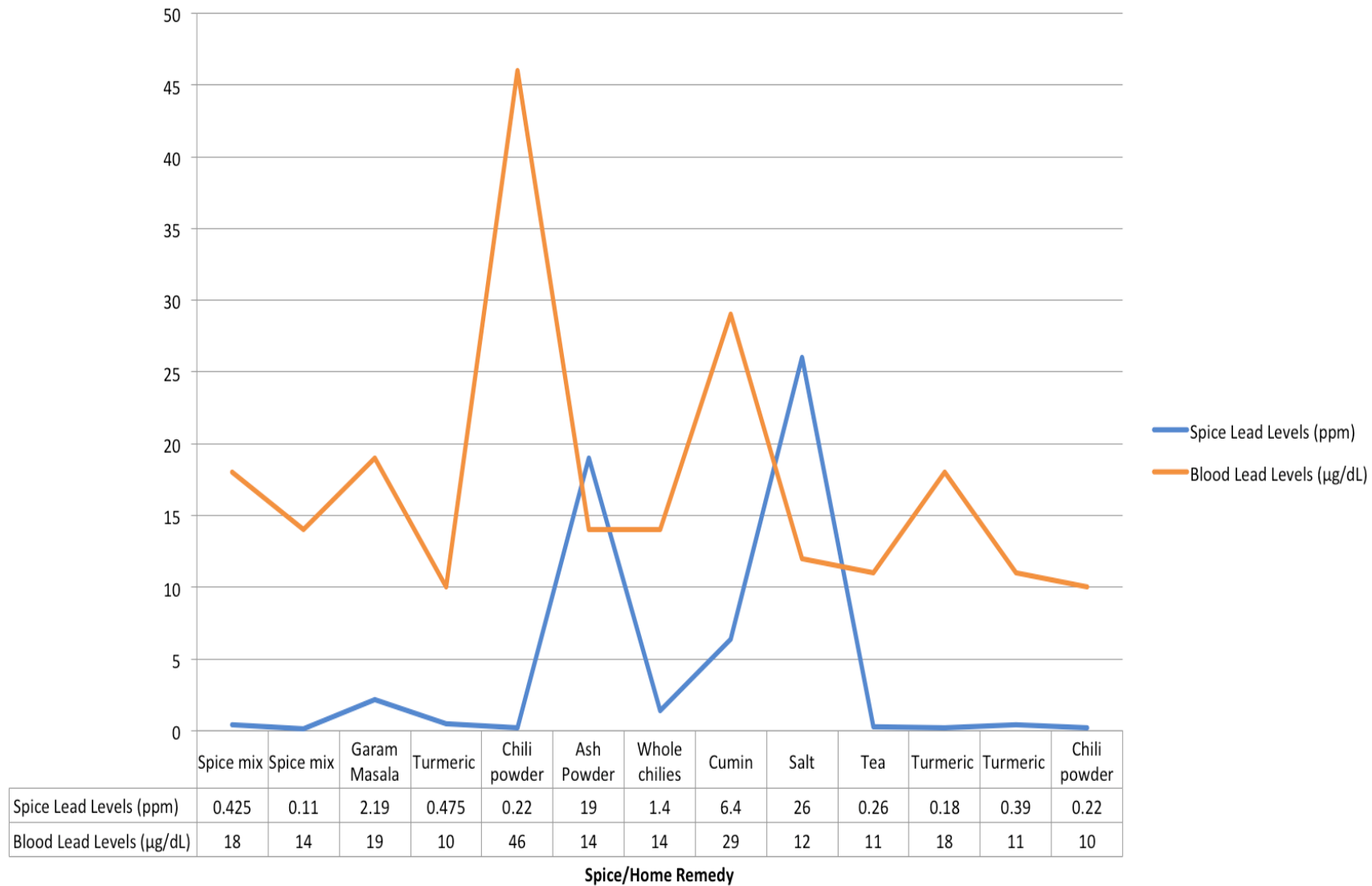
- Currently, there are 29 cases involving children with elevated blood lead levels and exposure to lead-laden spices and remedies
 - 15 have had preliminary blood testing
 - Being in the investigation stage, Table 1 shows the results and Graph 1 compares elevated blood lead levels to the spice consumption

Case Incidence

Table 1: Blood Lead Level Preliminary Results $\mu\text{g}/\text{dl}$ (N=15)

Type of Test	Average Result	Minimum Result	Maximum Result
Screening	20.6	6	64
Diagnostic	16.5	10	46

Graph 1: Diagnostic Blood Lead Level ($\mu\text{g}/\text{dL}$) vs. Spice/Home Remedy Lead Level (ppm) (years)



Lead and How it Gets into Spices




<https://www.bgs.ac.uk/Mendips/assets/pix/Galena.jpg>

- Industrialization or anthropogenic activities are the main sources of contamination in spices:
 - Smelting
 - Mining
 - Battery Production Facilities
 - Contaminated Water Sources
 - Rain Droplets

Lead and How it Gets into Spices

- Lead is absorbed into the plant root and dispersed throughout the entire plant where it lies dormant until the herb is processed⁶
- Spices and home remedies are subject to lead adulterants
 - Machinery and tools throughout the production process
 - Color enhancement
 - Increase the sale weight of the spice⁶





Childhood lead poisoning is one of the most common environmentally-caused, truly preventable pediatric health problem. There is no safe amount or “acceptable standard” for lead levels in the body as there is no level low enough in which adverse effects do not manifest.

Regulations

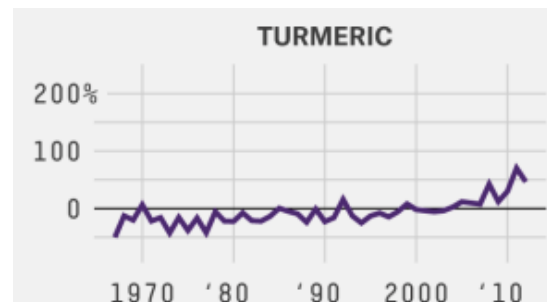
- The World Health Organization is the **only** world-renowned agency to set a limit for the amount of lead in spices, at 0.3 mg per kg⁸
- The FDA set a limit regulating the use of lead as a *colorant* in spices: 10 mg per kg⁹
- There are **no** guidelines established in the United States for lead levels in spices

Regulations

- The FDA does not require testing on *all* imports
 - Tests only 1% of and generally examined for pesticides or bacteria - not heavy metals¹²
- Once out on the market, the FDA recalls a spice if it has been found to test at or above 1 mg per kg¹²
 - A recall will occur only if a retest is performed on the spice and it is still above the threshold
- If the child has a blood lead level at 5 μg per dL, then a retest and a risk assessment should be performed¹³

Consumption

- Americans consume anywhere from 0.1 to 1.3 grams of spices per day¹⁴
- Consumption rate of Southern India ranging from 0.4 to 2.3 grams of spices per day¹⁵
- The per capita rate of spice consumption and the total domestic use of spices is now at 900 million pounds per year¹²

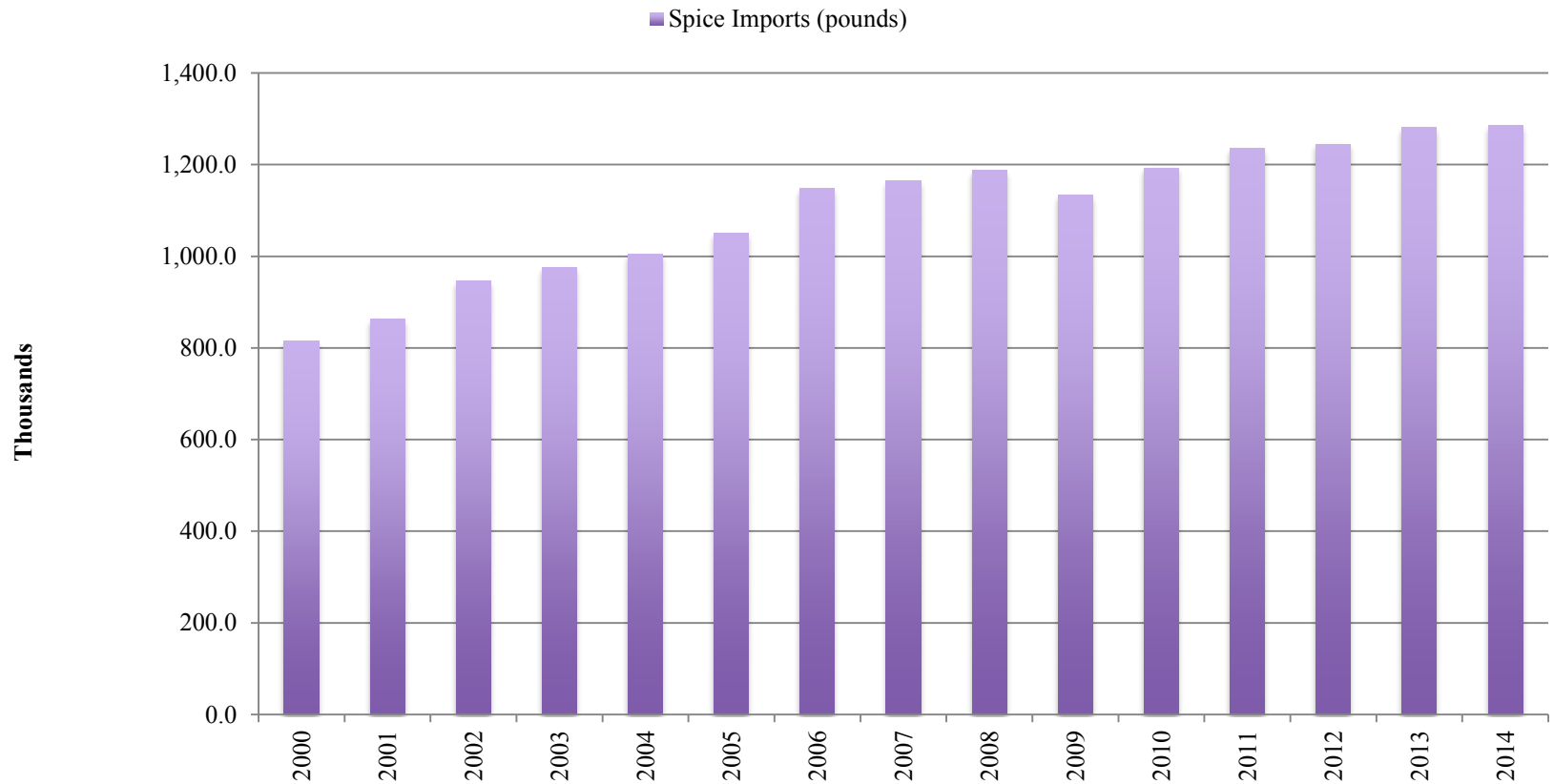


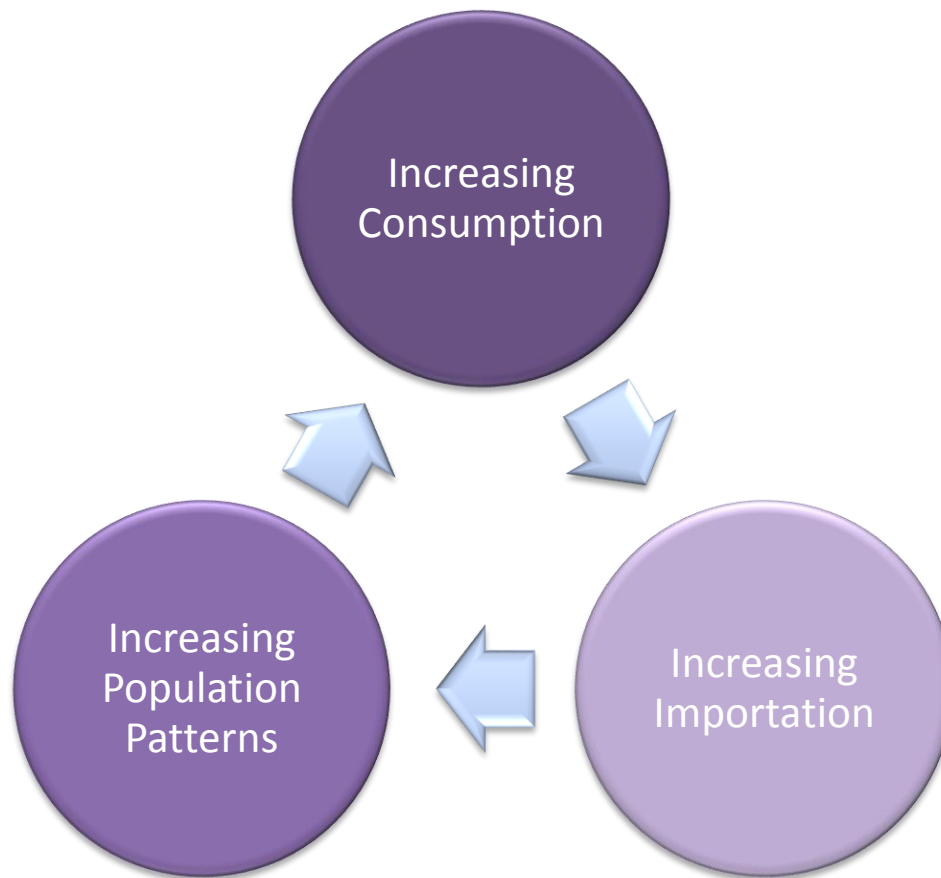
<https://espnfivethirtyeight.files.wordpress.com/2015/03/barryjester-feature-spices-2.png?quality=90&strip=all&w=575&ssl=1>

United States Importation

- Spices are imported at or near 100% ¹⁴
- 1,284,600 pounds of spices were imported into the United States in 2014 (Graph 2)¹⁴
- Top five import countries include Vietnam, India, China, Indonesia, and Brazil¹⁴

Graph 2: Spice Imports into the U.S. (2000-2014)







Surveys

Spice and Home Remedy Focus Group Participant Demographics

What is your age?

- ☐ 20 – 30
- ☐ 30 – 40
- ☐ 40 – 50
- ☐ 50 and over

What is your gender?

- ☐ Male
- ☐ Female

How many children do you have that are less than 6 years old?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4 +
- ☐ None

What is your country of origin?

- ☐ USA
- ☐ Other _____

If other, how long have you lived in the United States?

- ☐ Less than 1 year
- ☐ 1-5 years
- ☐ 5-10 years
- ☐ 10+ years

What is the primary language that you speak at home? _____

Spice and Home Remedy Survey

1. Is your child currently breastfeeding?
 - ☐ Yes
 - ☐ No
2. Does your child currently drink any formula?
 - ☐ Yes
 - ☐ No
3. Besides milk or formula, what does your child eat or drink most often?
4. How often do you cook at home?
 - ☐ 1-3 times a week
 - ☐ 3-5 times a week
 - ☐ 5-7 times a week
 - ☐ I never make home cooked meals
5. What spices do you cook with every week?
6. Does your child eat foods cooked with these spices?
 - ☐ Yes
 - ☐ No
- 6a. If yes, what foods?
- 6b. If no, do you cook separate foods that have no spices for your child?
 - ☐ Yes
 - ☐ No
7. How much of each spice do you typically put in foods listed in 6a? *Approximate measurements of each spice in teaspoon, tablespoons, cups, or fractions of the measurements.*

8. How big of a portion does your child eat of foods listed in 6a? *List each food one by one and request a separate portion size for each type of food as you list it. May have to give an example (1 cup of soup...)*
 9. How frequently does your child eat foods listed in 6a?
 - ☐ Several times a day
 - ☐ Once daily
 - ☐ Several times a week
 - ☐ Once weekly
 - ☐ Several times a month
 - ☐ Once monthly
 - ☐ Less than once a month
 10. Is there any time of year in which your child eats more of foods listed in 6a than others?
 - ☐ Yes
 - ☐ No
 - 10a. If yes, please explain what those times of year are for each food.
 11. Does your child take any herbal supplements? If yes, please list them at the bottom of this page.
 - ☐ Yes
 - ☐ No
 12. Are there any home remedies you make or buy that have spices in them, such as "golden milk"? If yes, please list them below.
 - ☐ Yes
 - ☐ No
- Please list the herbal supplements or home remedies:
13. Do you receive spices or home remedies from family members/friends in countries outside of the United States?
 - ☐ Yes
 - ☐ No

13a. If yes, do you use those spices in your child's meals and/or home remedies?

☐ Yes, which ones?

☐ No



Please list the following source information about the herbs and spices that you sample.

Herb/ Spice	Lot number	Circle One		Where purchased or sent from? (City, State, Country, Address)
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	
		Purchased	Sent by Family/ friends	





Focus Group

Focus Group

- Hosting a focus group tests:
 - The preliminary survey to ensure it is measuring the correct data needed to obtain evidence that children are being exposed at higher amounts than previously modeled
 - The reception of the survey in the target population: South Asian parents with children



Basic Outline of Focus Group

Introductions: 10 minutes

- Who we are
- Goals of survey and discussion
- Thank you's for coming
- Around the room introduction

Distribute Consent Form and Demographic Survey: 5 minutes

- Ask if there's any questions

Distribute Survey: 20 minutes

- Limit questions for discussion
- Explain that you do not have to thoroughly complete every question, rather think deeply about each question being asked

Discussion: 30 minutes

- Ask questions that have been created
- Allow for free form conversation but directed so not too much off topic

Closure: 5 minutes

- Conclude discussion and summarize overall impression
- Ask for any more questions
- Provide opportunity for people to pick up gifts if they want them
- Thank them again for coming out
- Give them contact information if they want any.

Ground Rules and Picture Index

Spice and Home Remedy Focus Group Ground Rules

1. WE WANT YOU TO DO THE TALKING

We would like everyone to participate. I may call on you if I haven't heard from you in a while. Please allow one person at a time to talk.

2. THERE ARE NO RIGHT OR WRONG ANSWERS

Every person's experiences and opinions are important. Speak up whether you agree or disagree. We want to hear a wide range of opinions.

3. WE WILL BE TAPE RECORDING THE GROUP

We want to capture everything you have to say. We won't identify anyone by name in our report. You will remain anonymous.

4. THIS IS STRICTLY VOLUNTARY

We appreciate your participation. Participation is strictly voluntary. It is based off of informed consent.

5. PLEASE BE RESPECTFUL OF PRIVACY

We want everyone to feel comfortable sharing when sensitive issues come up. Please do not repeat what you hear during this group conversation outside of this room.

Cinnamon
Dalchini



Coriander
Dhania



Cumin
Zeera



Curry Leaf
Kari



Spice and Home Remedy Focus Group Consent Form

Purpose:

The Children's Environmental Health section of the Division of Public Health is conducting a focus group of parents of children under 6. The purpose of the focus group is to pilot a survey on children's dietary intake of various spices and home remedies. Specifically, we want to understand what your opinion is of the survey. We will use this information to make the survey more user friendly. The survey will be used in home lead investigations throughout the state, in which spices are suspected as a source of lead.

Procedures:

If you choose to participate in this focus group, you will be in a group of approximately 6 to 10 parents/guardians. There will be a facilitator who will ask questions and guide the discussion, and a note-taker to write down the ideas expressed by the group. There will be a voice recorder that will record the entire session. If you volunteer to participate in this focus group, you will be asked some questions relating to demographics as well as your spice and home remedy use. These questions will help us develop culturally appropriate ways to investigate and educate people about alternative sources of lead.

Your participation is completely voluntary. You may withdraw from this focus group at any time without penalty. Everyone will be asked to respect the privacy of the other group members. You have the option to not disclose any demographic information. All participants will be asked not to disclose anything said within the context of the discussion, but it is important to understand that we cannot guarantee that other people in the group will keep all information private and confidential.

Confidentiality:

Anonymous data from this focus group will be analyzed by the Children's Environmental Health section. No individual participant will be identified or linked to the results. The results of this focus group may be used in future studies; however, your identity will not be disclosed. All information, including the voice recording and demographic information, obtained in this focus group will be kept strictly confidential. All materials will be stored in a secure location within the North Carolina Department of Public Health and access to files will be restricted to professional staff who have been trained in safeguarding data.

Consent:

By signing this consent form, you are indicating that you fully understand the above information and agree to participate in this focus group.

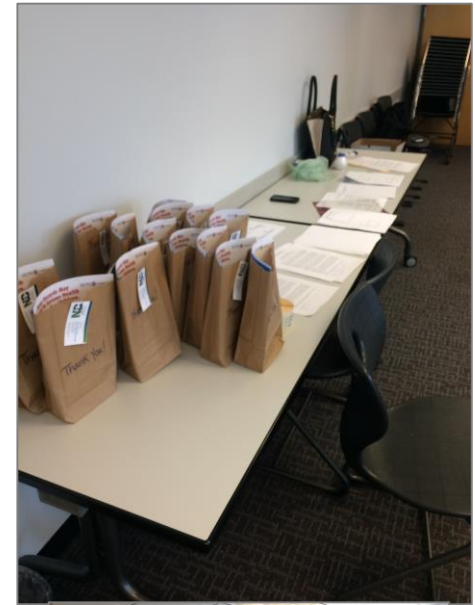
Participant's signature: _____

Printed name: _____

Date: _____

Focus Group

- Took place on February 18, 2017
- Held at a conference room at the West Regional Library in Cary, NC
- Five adults of various South Asian backgrounds participated
- Received a “Thank You” bag
- The recorded discussion lasted two hours



Focus Group

- As qualitative research, it not only helped capture real-time responses but:
 - Assisted in the comprehension and understanding of the way other cultures view this topic
 - Raised ideas about format issues
 - Measured the qualitative responses appropriately
 - Started a thorough discussion about the topic

Focus Group

- All attendees fit the cross-sectional population of being:
 - Parents of children under the age of sixteen
 - Representing the South Asian ethnicity
 - They not only spoke English at home but also other languages, such as Urdu
 - Were not born in the United States but their children were
 - The entire two hours was full of comfortable dialogue

Discussion

- With numerous children diagnosed - and **undiagnosed** - with lead poisoning each year, why not delve into every exposure route possible?
- The goal is not to cease the use of spices or cultural traditions, but rather to improve what has been unifying families around the dinner table for centuries: the spices we eat



<https://wingskart.pl/public/assets/Screen%20Shot%202017-01-16%20at%2011.59.36%20PM.png>

Discussion

- Best to host at least three focus groups in order to analyze the information
 - Due to time constraints, this area of my study is somewhat lacking
 - It is important because it provides data saturation for not only one focus group but also across-saturation of multiple groups¹⁷– Yields enough information to replicate the focus group while no new information is attained.
 - Failure to meet this threshold adds negative value and depth in my research¹⁷
- Presently, another focus group was hosted April 8, 2017

Discussion

- While the first focus group was a success, it did lack in diversity:
 - Ideally, having a triangulation of multiple ethnic groups will strengthen the validity of the survey– Not only hosting multiple focus groups, but each focus group is filled with participants of varying ethnicities
 - Having a varied cultural background provides multiple perspectives of the same phenomenon¹⁷
 - Will decrease any selection bias, including undercoverage sampling– This could occur when the sample at risk is not correctly represented from the total population

Discussion

- The surveys taken during the focus group were not meant for completion but rather **comprehension** – The preliminary survey data was not pertinent to this study
- Looking forward in analysis, I would like to have the correct sample group for the survey that will eliminate biases encountered when survey takers refuse to answer the survey thus causing an over or under estimation of the results

Discussion

- Collected from the focus group discussion:
 - The spice and home remedy survey is long enough to ask the necessary questions
 - I edited several formatting errors, specifically numbering organization
- Participants brought several valid points about spice use:
 - One participant shared that oftentimes they remove these potentially contaminated spices from their original containers, placing them in crockery or other storage

Discussion

- Concluding my survey work, I created a second survey composed of the same questions in a different format
 - This allows REHS the opportunity to pick between the depending on their feeling of the home and familial environment
 - Offering two survey formats allows individuals room if extra space is needed to complete answers or for those needing larger font
- Overall, Dr. Gaetz and I were extremely thrilled at the success and flow of the focus group and its positive perception thus far

Spice and Home Remedy Survey

1. Is your child currently breastfeeding?
 - ☐ Yes
 - ☐ No
2. Does your child currently drink any formula?
 - ☐ Yes
 - ☐ No
3. What, besides milk or formula, does your child eat or drink most often?

4. How often do you cook at home?
 - ☐ 1-3 times a week
 - ☐ 3-5 times a week
 - ☐ 5-7 times a week
 - ☐ I never make home cooked meals
 - ☐ Other, _____
5. Does your child eat foods cooked with spices?
 - ☐ Yes *(If yes, please refer to chart)*
 - ☐ No
- 5b. ~~If~~ no, do you cook separate foods that have no spices for your child?
 - ☐ Yes
 - ☐ No
6. Does your child take any herbal supplements?
 - ☐ Yes *(If yes, please list them at the bottom of the page)*
 - ☐ No
7. Are there any home remedies you make or buy that have spices in them, such as "golden milk"?
 - ☐ Yes *(If yes, please list them at the bottom of the page)*
 - ☐ No

Please list any herbal supplements or home remedies your child takes

Please list the following information about the herbs and spices that you sample.

Herb/ Spice	Brand	Lot number	Circle One		Where purchased or sent from? (City, State, Country, Address)	How often do you cook with this spice? (Weekly, Monthly, Biweekly, Everyday..)	Does your child eat foods cooked with this spice? (If yes, please write what foods)	How much of the spice do you put in the food your child eats? (tsp, tbsp , cups, fractions)	How big of a portion size does your child eat of the food cooked with this spice? (1 cup, 4 ounces..)	How frequently does your child eat foods cooked with this spice? (Several times a day/week/month, once/twice daily/weekly/monthly, every day)	Is there a time of year your child eats this food more often? (Specific religious holiday/festival)
Ex) Turmeric	Deep Brand	21516	Purchased	Sent by Family/ friends	Raleigh, NC	Everyday	Soup Chicken Oatmeal	1 tsp 2 cups 5 tbsp	1 cup 2 ounces 2 cups	Several times a month Twice a week Everyday	During Diwali During Holi No
			Purchased	Sent by Family/ friends							
			Purchased	Sent by Family/ friends							
			Purchased	Sent by Family/ friends							

Impact of Lead Surveillance

- The Spice and Home Remedy Survey will assist in accurate and adequate data collection
 - Facilitate conversation
 - Broaden knowledge
- Provide “Consumer Consciousness”



<https://consciousconsumers.nz/>

Impact of Lead Surveillance

- Continuous monitoring of lead will broaden our understanding of the negative symptoms children present
- Through focusing on the amount of contaminated spice and/or home remedy the child is consuming and comparing that to the elevation of lead levels in the blood and logging what symptoms, or lack of, would be a curious area to delve

Recommendations

- If the survey has a positive impact, then a number of things could take place including:
 - Initiation of distributor responsibility in food safety testing,
 - Standardized FDA thresholds (similar to the WHO threshold for an allowable limit of lead in spices and home remedies)
 - Confirmation of the severity of the issue and the education thereof
 - Recall issuance of spices consistently tested for lead contamination
 - Use of media tools to ensure public awareness to initiate the recall

Recommendations

- Perform at least two more focus groups to better test the Spice and Home Remedy Survey
 - The study will begin to realize success once we are confident that the survey is measuring the at risk population and is consistently used throughout the state
- A Morbidity and Mortality Weekly Report would disseminate the information to the Centers for Disease Control and Prevention, also increasing awareness across the nation

Recommendations

- Contact Consumer Reports to set up a market basket study of various spices in retail stores around Wake County
 - Funds are decreasingly low
 - A trusted resource



<http://www.consumerreports.org/cro/index.htm>

Conclusions

- This paper serves to display the importance of the survey in attaining consistent testing methods of spices and home remedies during home visits
- Appropriate and accurate data collection is the foundation of truly effective study



<http://i.huffpost.com/gen/1091491/images/o-SPICES-GUIDE-facebook.jpg>

Conclusions

- The lack of reporting signifies the lack of knowledge about lead in alternative exposure sources
- Once governmental agencies take responsibility and spread knowledge about this attenuating issue in our food supply, fewer children will have lead poisoning

Core Competencies

- Environmental Health
 - Understanding how lead contaminates spaces and home remedies
- Epidemiology
 - Tracking the incidence, distribution and control of childhood lead poisoning
- Health Service Administration
 - Observing the roles of public health officers in the department of health and human services
- Social and Behavioral Sciences
 - Observing the impact of lead poisoning on a variety of cultures
- Biostatistics
 - Assessing data collected and relating it to childhood lead poisoning

Future Biostatistics Evaluation

- Presently, there is not enough data however when it comes time I would ask “Is there a significant difference in frequency of spice use among children with elevated blood lead levels and the average U.S. child that does not have elevated blood lead levels?”
 - In order to ensure consistent, reliable answers , I would use a Chi-Square methodology
 - To answer this question I will have to figure out what numbers I might expect if everything were left up to chance:
 - If H_0 (null hypothesis) were true, then there is no difference in spice consumption between the children with elevated blood lead levels and average US children, based on the averages presented
 - All answers would be equally distributed among the possibilities so that once I get the expected values, I can compare them to the observed values
 - I can compute the chi statistic using the formula: $\chi^2 = \sum \frac{(\text{Observed Value} - \text{Expected Value})^2}{(\text{Expected Value})}$
 - I would then look up the chi squared table and look at the degrees of freedom “1” to find the probability of result to retain that my null hypothesis is true.

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- My husband and Family
- Candlewood Veterinary Clinic



*Health and
Human Services*

https://www2.ncdhhs.gov/control/images/NC_HlthHumanSeblk.jpg

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