MDHHS
Michigan Department of Health & Human Services

Environmental Investigator Series: Cultural Lead Exposure Sources

South Asia



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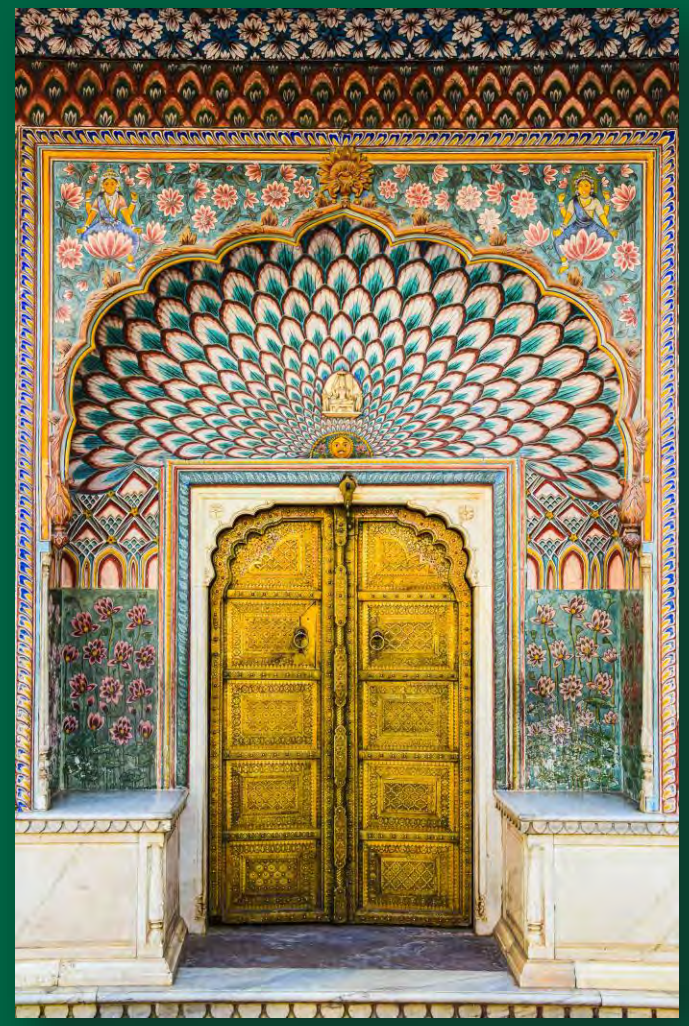
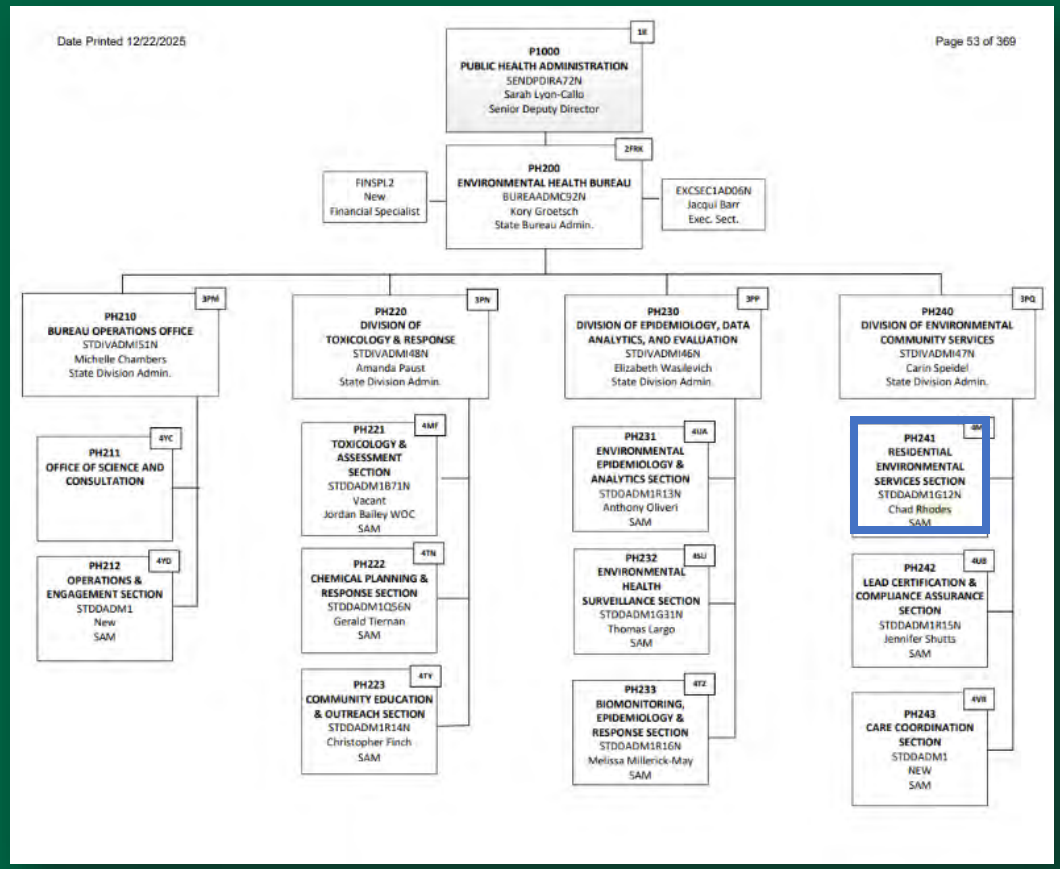


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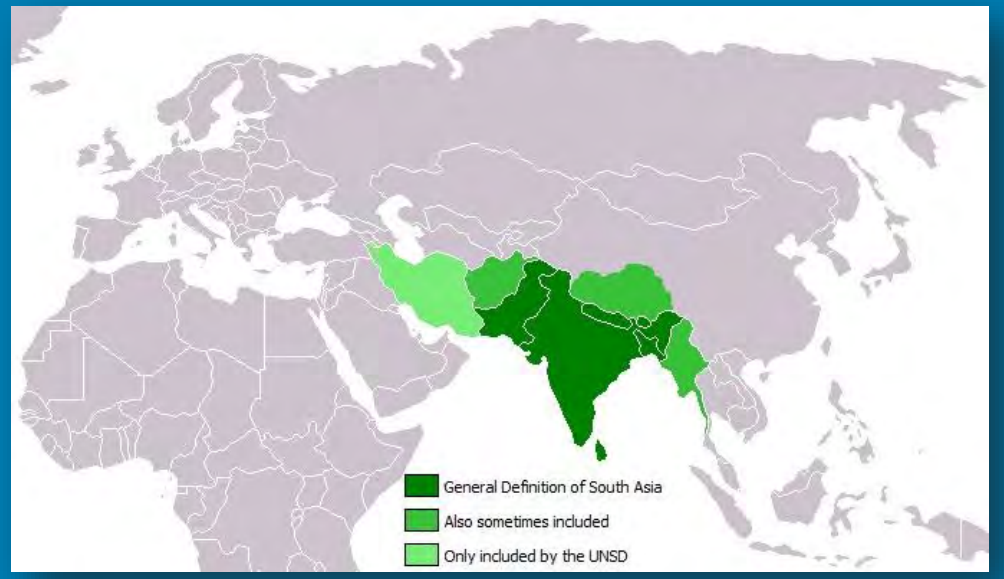
Background: EBL Environmental Investigation

- When a Michigan child with an Elevated Blood Lead Level is identified, there is a process for an environmental investigation and intervention
- Lead Inspection Unit and private vendors are tasked with investigating living environments of EBL children and educating parents/guardians to strengthen intervention action by Public Health Nurses and the Lead Abatement Unit
- Current Guidance "*Environmental Investigation Protocol For Children With Elevated Blood Lead Levels*"



Background: Michigan's SA Population

- Per Gemini AI: "A reasonable estimate for the number of people of South Asian descent in Michigan would be in the range of 120,000 to 150,000+, with the largest component being those of Indian descent."
- Many of these lead exposure hazards may be found across South Asian cultures and beyond
  - Bangladesh
  - Bhutan
  - Maldives
  - Nepal
  - Pakistan
  - Sri Lanka
  - Afghanistan



Background: Goals

- Goal 1: Create a non-paint sources of lead exposure educational resource for PHNs, Clinicians, EBL Investigators, and Michigan cultural communities.
- Goal 2: Inspire and collaborate with other Public Health colleagues where our roles and goals overlap.



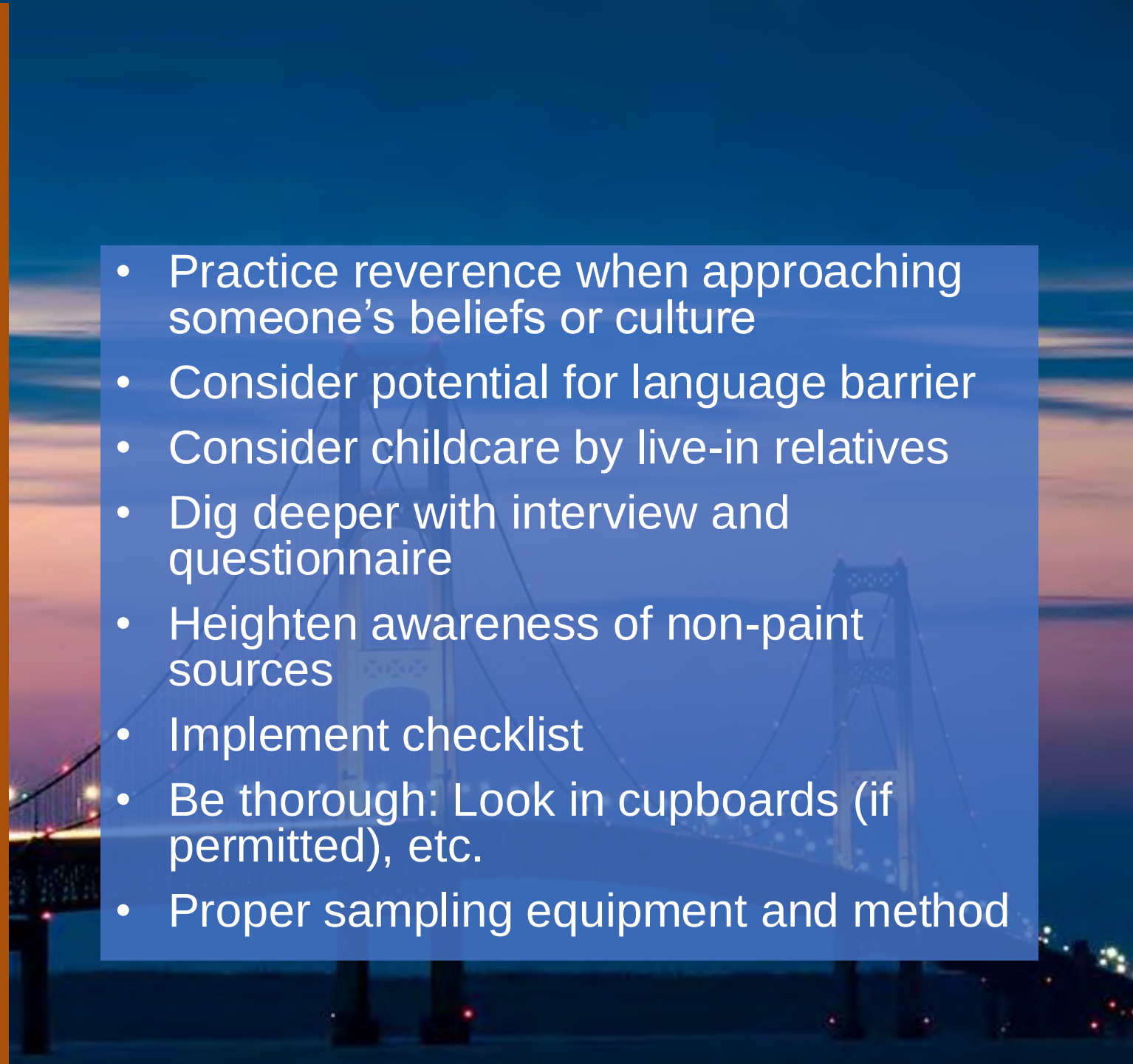
Non-Paint Sources & Universal Testing

- Rules for implementation of Universal Testing made official on April 30, 2025.
- We may unofficially expect to see an increase in EBL cases that:
  - Have exposure sources that are not lead-based paint.
  - Are more socioeconomically diverse
  - Are more geographically diverse

General Considerations for EIs & Cultural Sources

in a home with cultures, religions, backgrounds, or influences associated with South Asia.

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- Practice reverence when approaching someone's beliefs or culture
- Consider potential for language barrier
- Consider childcare by live-in relatives
- Dig deeper with interview and questionnaire
- Heighten awareness of non-paint sources
- Implement checklist
- Be thorough: Look in cupboards (if permitted), etc.
- Proper sampling equipment and method

Religious & Cultural Powders and Cosmetics

Sindoor for hairline, bindi, marital status

Kumkum for marital status, respect

Gulal for festivals and funerals

Abil for rituals

Sandalwood powder for cosmetics and spiritual





Religious & Cultural Powders and Cosmetics

Name	Composition/Color	Primary Use/Significance
Kumkum	Yellow/Orange/Red often made from turmeric and alum/lime	Social and religious markings (Tilak or Bindi)
Sindoor	Red cosmetic powder	Primarily married Hindu women in parting of hair
Vibhuti (Bhasma)	White/Grey ash from burnt wood or cow dung	Symbolizes transition between the tangible and intangible. Applied forehead, arms, and/or chest
Chandan	Yellow/tan sandalwood ground into paste/powder	Applied to forehead
Haldi	Yellow/Orange	Used in weddings and medicinal offerings
Abir/Gulal	Multicolored powder made from flowers or herbs (traditionally)	Primarily Festival of Holi

Religious & Cultural Powders and Cosmetics

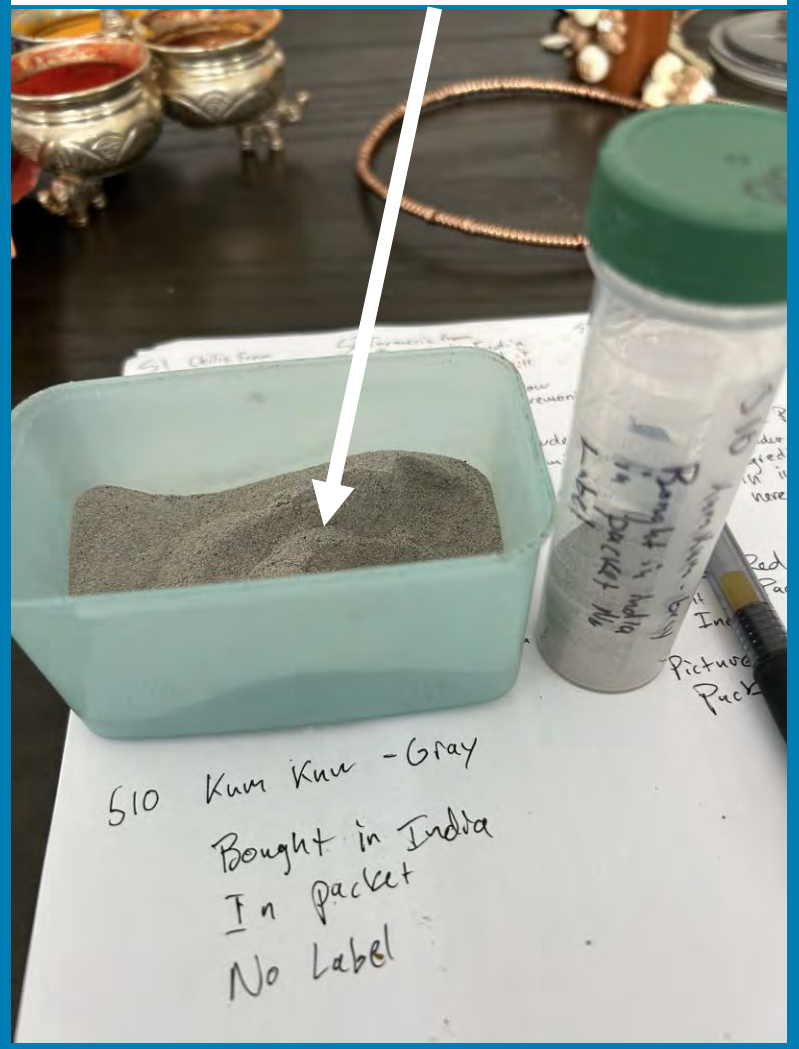
May have to ask for bulk container



Insufficient amounts for sampling. EBL child was wearing yellow (potential for lead chromate in turmeric). Think about child access.



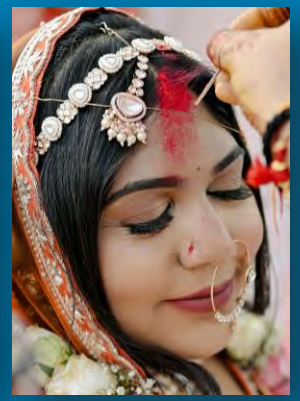
Ceremonial ash, Vibhuti or Bhasma or Asthi Visarjan, for offerings and funerals



Religious & Cultural Powders and Cosmetics







Sindoor and Kumkum

- AKA: Sindur, Sindura, Sindhuram, Vermillion, Roli,Tikka, Tilak, Kunguman, Kunkuma, Kum, Haldi, Pottu, Teep, and Tip
- Can contain Trilead tetroxide (Pb_3O_4), Lead chromate ($PbCrO_4$), Zinc, and Mercury. Vermillion is mercury sulfide.
- Risk Note: High risk for high EBL due to potential for high lead concentration. Also risk for mercury poisoning.
- Sample 461 of NYCHD Metal content of consumer products: Sindoor (orange powder): **330,000 ppm** lead! Sample from 2025 MDHHS EI of Kumkum (orange powder): **675,000 ppm** lead! Child had an EBL of 51.4v µg/dL.
- Sample if:
  - Worn by caretakers or child, or
  - Accessible to child, or
  - Ingested by child
- If visible amounts are on floor in front of Ghar mandir or on Ghar mandir in Puja Room, or if insufficient amount for valid sample, conduct a dust sample of these areas.

Religious & Cultural Powders and Cosmetics



Sacred Ash and Sandalwood Powder

- Sacred Ash AKA: Vibhuti, Vibhooti, Bhasma, Bhasmam, Tirupati, Thiruneeru, Tirunīru, Tamil, and Asthi Visarjan
- Sandalwood AKA: Chandon, Chandana, Kalabham, Gandha, Chandanam, Javadhu, Sukhad
- Risk Note: Lower risk in absence of other religious & cultural powders. Increased risk if potential for cross contamination with powders with very high concentration.
- Sample if:
  - Worn by caretakers or child, or
  - Accessible to child, or
  - Ingested by child



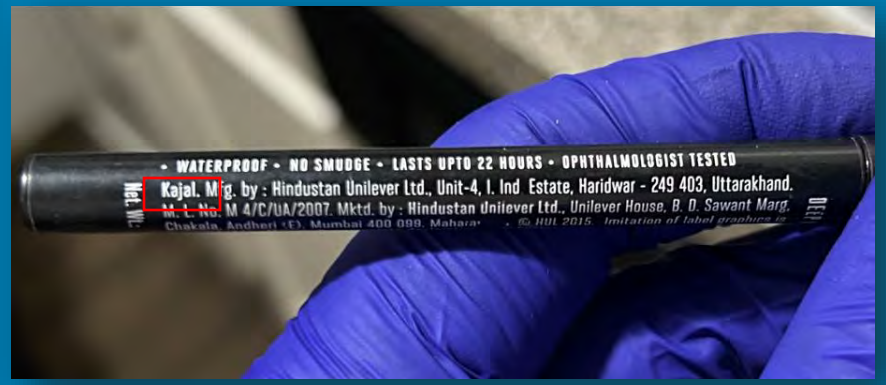


Religious & Cultural Powders and Cosmetics

Kohl (Kajal/Kanmashi) and Surma

- AKA: Al-Kahal, Tiro, Tozali, Kwalli, Sormeh, Athmad, and Ithmid
- Can contain Lead(II) sulfide (PbS)
- Risk Note: High risk for high EBL due to potential for high lead concentration (most notably Surma).
- One brand was **840,000 ppm** lead (al-Hazzaa & Krahn, 1995)!
- The Federal Food, Drug, and Cosmetic Act (FDCA) bans importation of these in US.
- Sample if:
  - Worn by caretakers or child, or
  - Accessible to child, or
  - Ingested by child
- It's unlikely there will be sufficient amounts for current laboratory sampling minimum requirements. Wide variety of containers/forms.



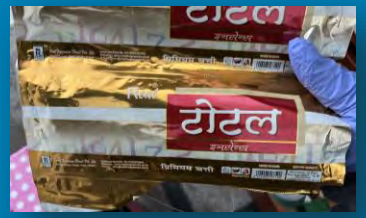






Religious & Cultural Powders and Cosmetics









Incense

- AKA.: Agarbatti, Loban, Agarwood, Dhoop, Batti, Bukhoor, and Bakhoor
- Can contain Lead(II) oxide (PbO) in smoke and others in colorants
- Found as sticks, lamps, powder, cones, and coils
- Risk Note: Lower risk for high amounts of lead though often contains several heavy metals and other EH concerning chemicals (Yadav et al., 2022, Hung et al, 2020).
- Sample if:
  - Product or product ash potentially ingested by child, or
  - Incense burned daily for long term (lead loads on horizontal surfaces)







Religious & Cultural Powders and Cosmetics



Other Cosmetics of Concern

- Fairness cremes
  - Found to contain heavy metals.
  - Risk Note: Several cases with high EBLs. Risk for mercury.
  - Sample if:
    - Ingested by child, or
    - Caretaker or child use product.
- Henna
  - Often used as hair dye or for direct application to skin.
  - Risk Note: Not many documented cases with high EBLs
  - One study found 65.98 PPM lead (Jallad & Espada-Jallad, 2008)
  - Sample if:
    - Ingested by child, or
    - Worn by caretaker or child, or
    - Child's hair dyed with product









Religious & Cultural Powders and Cosmetics



https://www.pexels.com/photo/vibrant-painted-faces-peeking-through-door-33561233/

Other Cosmetics of Concern

- Face Paint
  - Pure earth report found face paint designed for children contained 128,400 ppm lead.
  - Sample if:
    - Ingested by child, or
    - Caretaker or child use product.
- Nail Polish
  - Personally imported/non-domestic nail polish very commonly contains lead.
  - Sample if:
    - Ingested by child, or
    - Worn by caretaker or child.
- Imported Lipstick, Eyeshadow, Face Powder, Mascara, Liquid Foundation/Concealer, and Hair Products were all found to contain lead above Pure Earth's reference levels in report.
  - Sample if:
    - Ingested by child, or
    - Worn by caretaker or child



https://www.pexels.com/photo/intricate-henna-design-featuring-a-golden-ring-38274759/

Spices

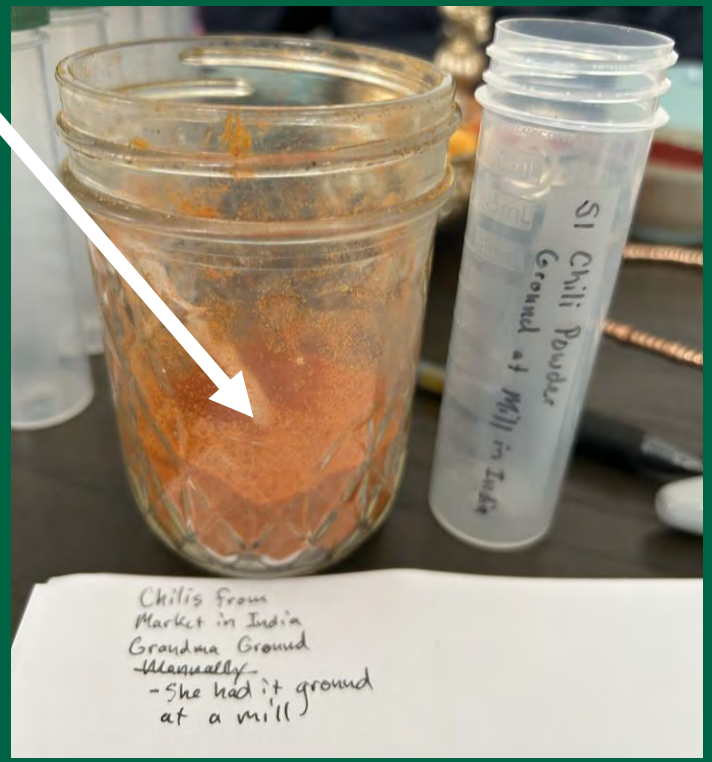


Chili powder

Curry Powder







Spices



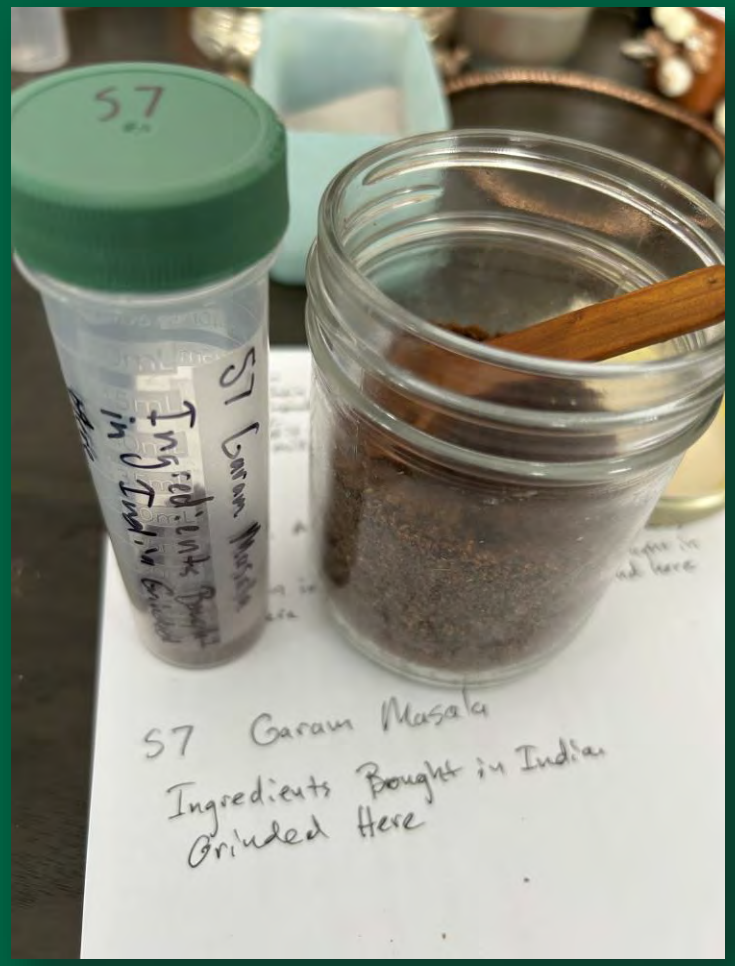




Cooking culture is highly regional and several cuisines commonly use an abundance of spices.

- Source of lead in spices:
  - 1. Adulteration
    - Lead chromate common adulterant
  - 2. Processing-sourced contamination
    - If self-processed or private mill-processed, potential for contamination from equipment.
  - 3. Soil-sourced contamination

Spices



EBL Investigator Considerations:

- Highest risk spices are turmeric, chili powder, cinnamon, cumin, and curry powder (Angelon-Gaetz et al., 2023).
- Garam masala, chaat masala, black pepper, coriander, garlic powder, saffron, sesame seeds, and white pepper have also been implemented in EBL cases.
- Risk Note: Likely to be used often/intentional ingestion.
  - Sample if:
    - Child ingests, or
    - Breastfeeding mother ingests, or
    - Woman of childbearing age ingests
  - Bulk spices: Record the provenance of each spice.

Spices


Turmeric
Chili Powder
Coriander Powder
Moringa Powder
Seeds




F2: Turmeric: No Label


Shan
SPECIAL
BRAIN MASALA
RECIPE & SEASONING MIX
Net Wt./Poids Net
50 g (1.76 oz)


MDH
Hyderabadi Biryani masala
Spices blend for Mutton Biryani
Net Wt. 50g (1.75 oz.)





Food

- Street Foods
  - Artificial Dyes
    - Brightly colored sweets
      - Laddoo, Gulab Jamun
- Rice and Wheat
- Processed Snacks and Candies
  - Tamarind Candies
  - Chat Masala and Snack Mixes
- Eggs and Poultry
- River Fish
- Risk Notes: Low likelihood of shipping and relatively low lead concentration, but intentionally ingested.
  - Almost always requires Toxicology consult. Please let State Nurse Case Manager if anything is of concern.

Ayurvedic Medicine

Ayurvedic Medicine may appear in many forms, in many styles of containers.

Ayurvedic medicine: Alternative medicine system developed in India with ~80% of population (or 1.1 billion) practicing.

- 90% plant based with similar contamination source risks as spices.
- Began to gather momentum in US in 1970s.
- “The science of life.”
- Not regulated as medicine.









Ayurvedic Medicine

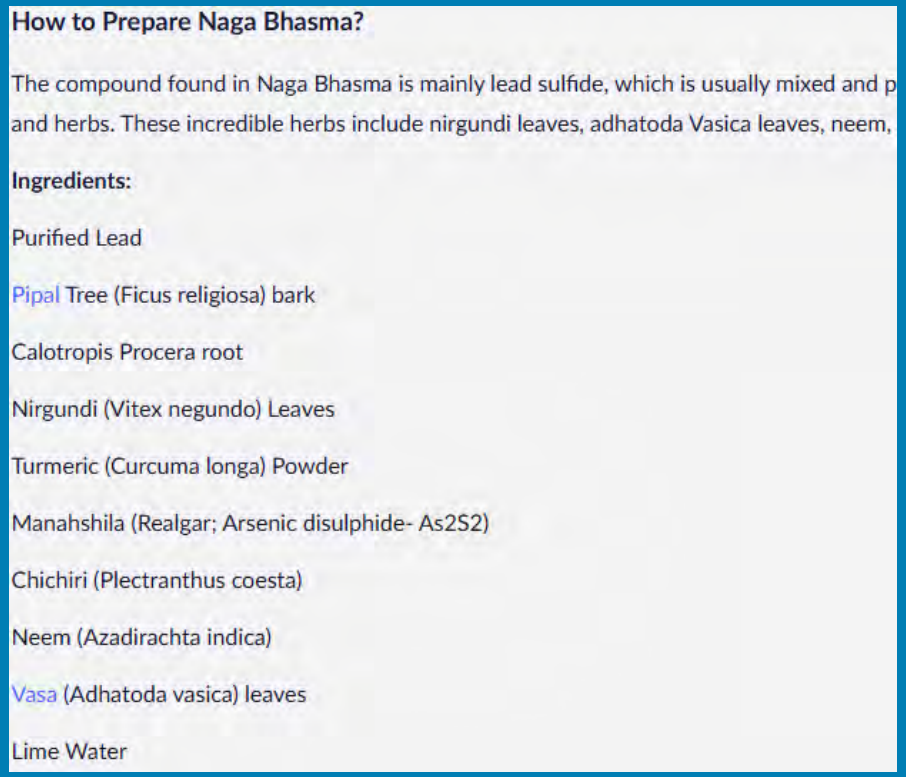
Some Ayurvedic Medicine is design specifically for babies.

1 of 5 US-manufactured and Indian-manufactured Ayurvedic medicines purchased on the Internet contain detectable lead, mercury, or arsenic. (Saper et. al, 2008)





Ayurvedic Medicine



How to Prepare Naga Bhasma?

The compound found in Naga Bhasma is mainly lead sulfide, which is usually mixed and p
and herbs. These incredible herbs include nirgundi leaves, adhatoda Vasica leaves, neem,

Ingredients:

Purified Lead

Pipal Tree (Ficus religiosa) bark

Calotropis Procera root

Nirgundi (Vitex negundo) Leaves

Turmeric (Curcuma longa) Powder

Manahshila (Realgar; Arsenic disulphide- As2S2)

Chichiri (Plectranthus coesta)

Neem (Azadirachta indica)

Vasa (Adhatoda vasica) leaves

Lime Water

https://www.netmeds.com/health-library/post/naga-bhasma-benefits-uses-ingredients-method-dosage-and-side-effects?srsltid=AfmBOoojPZCAYGGDIOpOeEPJSs3MNQN5R_11X8D6fgyclvd-ielUjUNn

- Includes: Balguti, Balguti Kesaria, Kesaria Balguti, Bhasma, Bali Goli, Bala Goli, Boli Goli, Ghasard, Kandu, Bint al Zahab, bint al Dhahab, Bint, Bent Dahab, Saoott, Cebagin, Desi dawa, Ghasard, Kandu, Kushta, Kushtas, Kushtay, Kushtala, Santrin, Santrini
- Can contain Lead, Arsenic, Mercury, Cadmium, Zinc, Iron, Copper, Chromium, Silver, Barium, Nickel, and Antimony.
- Many specifically for babies as tonics and teething powders.
- Risk Note: High risk for high EBL due topotential for high lead concentration.
- Adult case with BLL of 55v µg/dL (Gitelman et al., 2023).
- Sample if:
  - Child ingests, or
  - Breastfeeding mother ingests, or
  - Woman of childbearing age ingests

Other Traditional Remedies and Medicines



- Siddha Medicine
  - Powder preparations use lead, mercury, and arsenic.
    - Muppu and Bhasmas are most common sources of lead exposure
- Unani Medicine (Unani-Tibb)
- Sowa Rigpa (Tibetan Medicine)
  - Rinchen Tsel: “Precious Pills”
    - Mercury most common, lead may be present
- Herb Supplements
  - Can contain lead from contaminated soil
    - Ashwagandha
    - Brahmi
    - Others
- Edible Clay
  - Pregnancy cravings: Geophagy
    - Kadi/Mitti
      - Small pieces of roasted clay sold in markets can be highly contaminated with lead

Cookware/ Foodware

Cookware resembling brass, aluminum, stainless steel, glass, ceramic, stone, and others can contain lead.













Cookware/ Foodware





- Brass: historical tradition, cultural significance, and economic factors. Associated with purity, positivity, and prosperity.
- Aluminum: Economic. Automobile radiator parts, and electronic parts make their way into recycled metal stock. Leaches particularly well in acidic conditions. Some alloys may appear more like stainless steel!
  - Alloys 2011 and 6262 lead is intentionally added.
- Crude cookware manufacturing means manual selected alloy components. Same process can be used for spice mill rollers. Elemental lead and lead contaminants can be inconsistently dispersed in product.
- Pestle/Mortar and other foodware can generate exposure by mechanical grinding rather than leaching.

Cookware/ Foodware



FDA's guidance is that any level of leachable lead upon testing is prohibited.

- FDA provides methods for leach testing in the "FDA Elemental Analysis Manual for Food and Related Products"
- "Lead, or a component material containing lead in cookware, is an unsafe food additive, and cookware that leach lead are adulterated under section 402(a)(2)(C)(i) of the Federal Food, Drug and Cosmetic Act (FD&C Act)" (Whittaker, 2023)

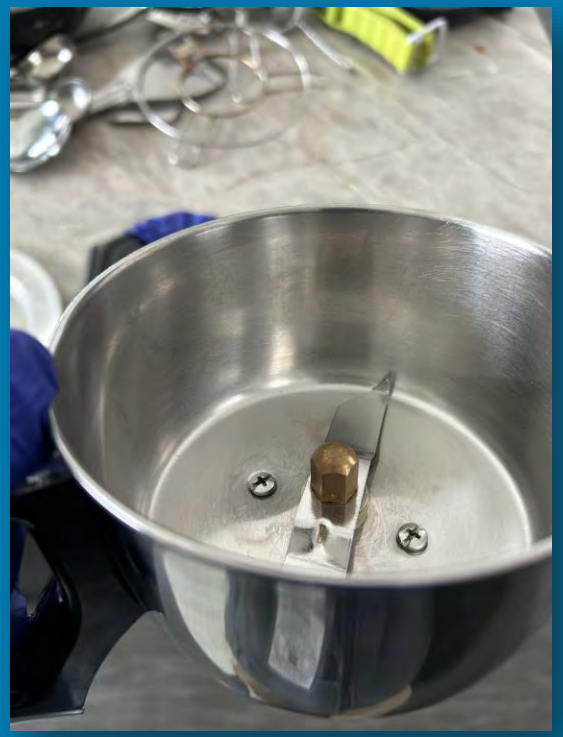
Cookware/ Foodware



17.3 mg/cm^2 or ~86,500 ppm or ~8.65%

- Potential to contain elemental lead and leach into food and beverages (Fellows et al., 2024; Ali Sultan et al., 2023).
- Risk Note: Family impact, select metals and ceramics can cause high EBLs.
- XRF all foodware with potential to expose:
  - Child, or
  - Breastfeeding mother, or
  - Woman of childbearing age
- Also consider pressure cooker valves and blender nuts.

Cookware/ Foodware



- Appliances for processing, preparing or cooking food: imported blenders, food processors, pressure cooker valves.
- Risk: Not well understood.
- If used to prepare food for child or pregnant mother
  - XRF components (if possible).
  - Can also prepare food, test raw ingredients, test blended ingredients.

Jewelry

Amulets, Taweez, Tabiz, Taviz, Tobiz, Bangles, Ornate Necklaces, Earrings, Bracelets, etc.

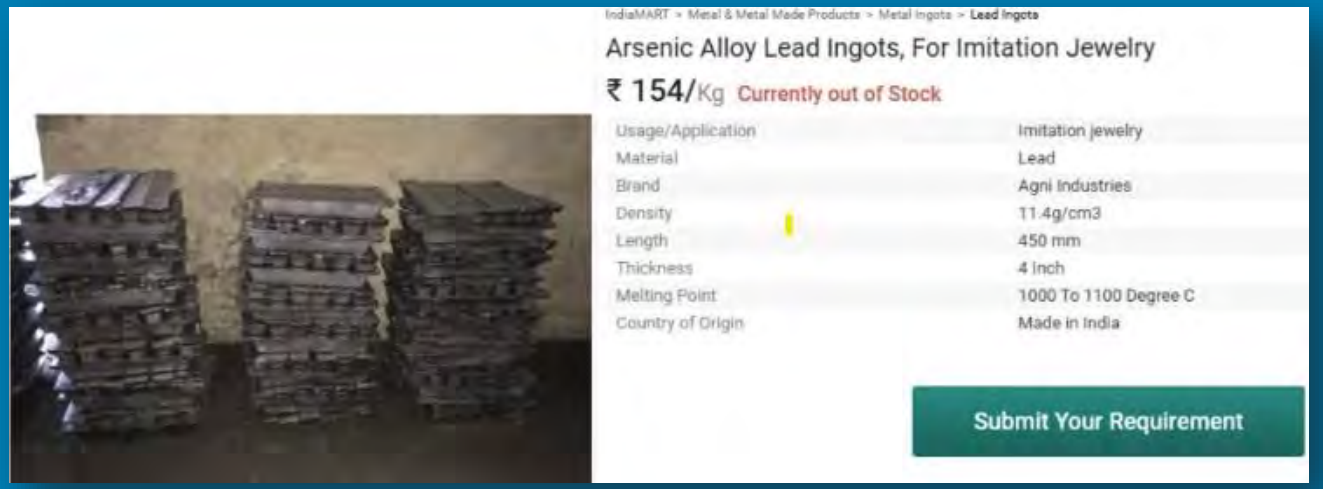




Jewelry



- Potential to contain elemental lead (Hauptman et al., 2024).
- XRF all jewelry with potential to expose:
  - Child

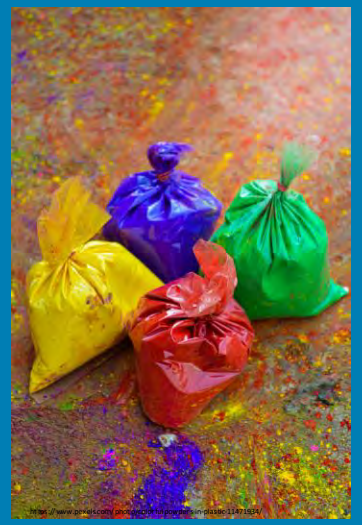


Sacred Floor Art



Rangoli or Kolam

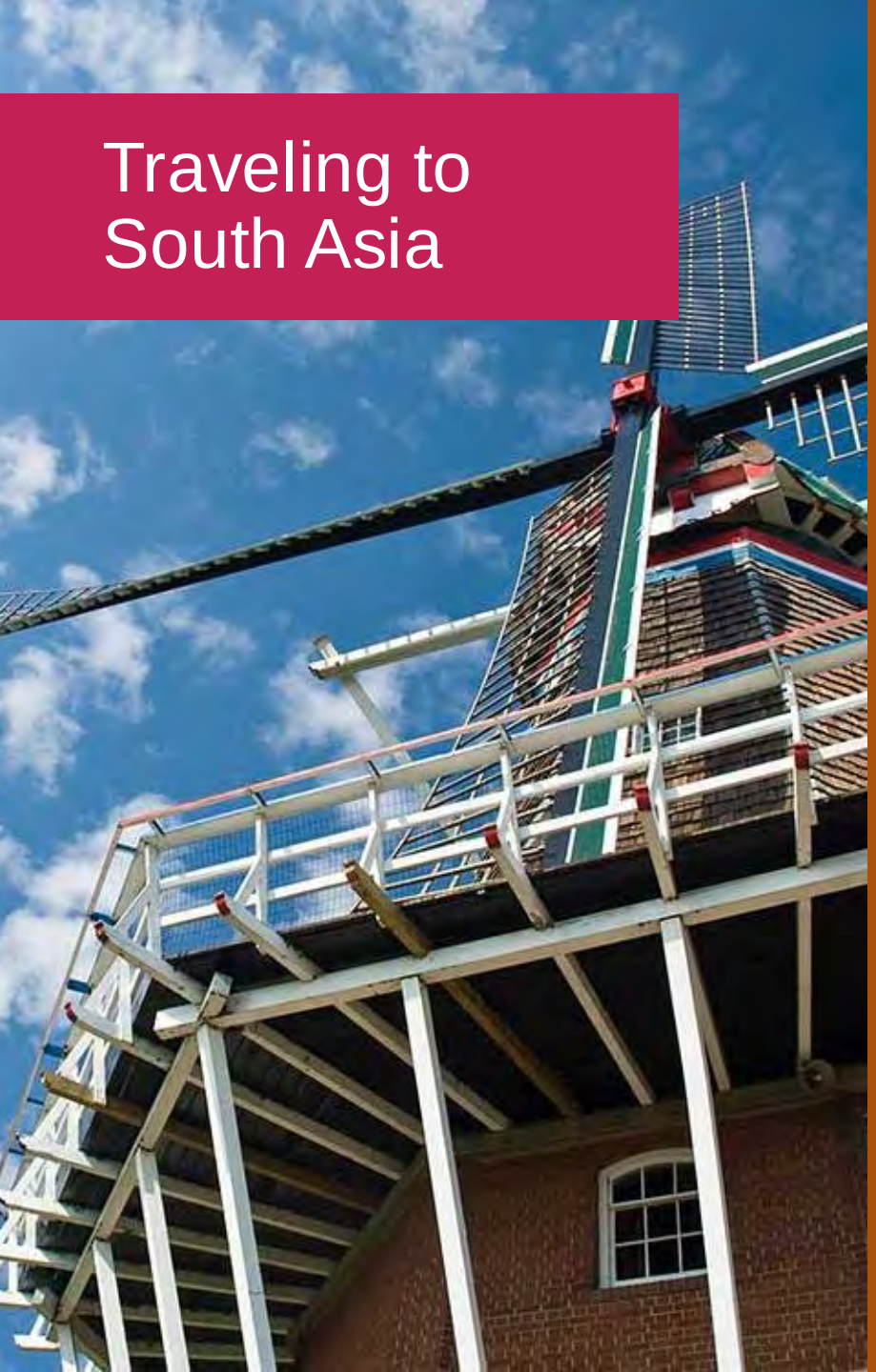
- Utilizes: Ground white rice, Ground marble or limestone, Geru (red earth/ochre, Spices, and Modern chalk sticks
  - Calabash chalk: 19.26 ppm lead (Neelotpol et al., 2023)
- Some products intentionally contain lead-based dyes. Bright colors, extremely inexpensive may be more likely to contain contaminants. Rare in domestically source chalk.
- Risk Notes: Potential to contain lead chromate, mercury, and cadmium.
- Modern domestic chalk sticks Generally low exposure risk, but look for biting/eating marks.







Traveling to South Asia



- We ask parents/guardians about recent travel because of the likelihood the exposure didn’t happen at the home. It also gives insight into what personal items were brought directly from the region.
- The regions is regulatory enforcement of lead-content in modern paint is relatively low. 2023 study showed 90% of recently manufactured household paint in India contained lead over permissible limit.
- Roughly half of children in India have EBL over 10 µg/dL. (~64 million children)
- Several other lead exposure risks in addition to all other aforementioned sources.

Sampling Considerations

- Exposure risk-based determinations.
  - Thoughtful interviewing, follow-up questions, and notetaking.
  - There is a lot we do not know, because there is not much data, but we're working to change that.
- Consider nitrile gloves for entire investigation.
- Stainless steel scoopula
- Know limitations of XRF vs. Dust Wipe vs. Laboratory Analysis
- The risk notes and sampling guidance in this presentation are recommendations only. Lead can be in almost anything, so sample if you believe it could be an exposure source based on the information you have!

Ethnicity	Cosmetics	Foods	Remedies
Latino	☐ Ceruse	☐ Tamarind Candy ☐ Chocolate covered grasshoppers ☐ Chile flavored candies	☐ Alarcon ☐ Albayalde ☐ Azarcon ☐ Coral ☐ Greta ☐ Liga ☐ Litargiri ☐ Maria Luisa ☐ Rueda
Middle Eastern, Indian, Pakistani, African	☐ Alkohl ☐ Henna ☐ Kohl ☐ Kum ☐ Saoot ☐ Sindoor ☐ Surma	☐ Lozeena	☐ Al Murrah ☐ Ayurvedic ☐ Balguti ☐ Bali Goli ☐ Bint Dahab ☐ Bokhoor ☐ Cebagin ☐ Deshi Dawa ☐ Ghasard ☐ Kandu ☐ Kushta ☐ Santrini
Southeast Asian, Chinese		☐ Ba-Baw-San ☐ Chuifong Tokuwan ☐ Jin Bu Huan ☐ Pay-Loo-Ah ☐ Po Ying Tan ☐ Ginger candy ☐ Plum candy	☐ Cordyceps ☐ Hai Ge Fen ☐ Ju Hua ☐ Litharge
Other?	☐ What? ☐ What?	☐ What? ☐ What?	☐ What? ☐ What?

If any of the above are used, please specify when it was last used, the frequency of use, how it is used, and where it was purchased (location).

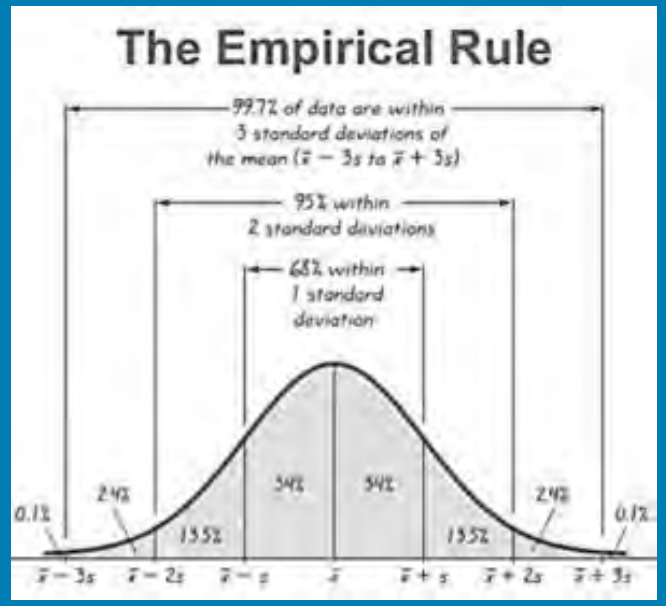
Item name	When last used	Frequency of use	How it is used	Where it was purchased or obtained
Item name	Used last?	Frequency	How used?	Where purchased?
Item name	Used last?	Frequency	How used?	Where purchased?
Item name	Used last?	Frequency	How used?	Where purchased?
Item name	Used last?	Frequency	How used?	Where purchased?

Sampling Considerations: XRF

XRF Field Screening:

- Foodware, Cookware, and Jewelry
- Potentially others depending on XRF Model, specifications, and settings.

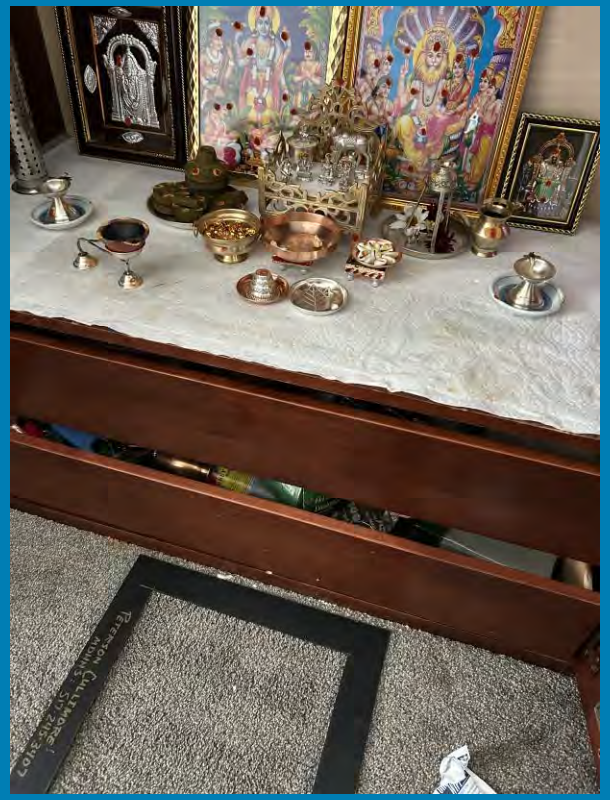
- Viken Pb200i: Utilize XRF Settings: Setup>Mode>Unlimited Time AND Setup>Test Screen Display>Precision>ON
  - This shows Standard deviation to 2σ (Two sigma) or 95% of data fall within range.
  - Unlimited mode requires trigger pull to start reading and to end reading. I usually try to get approximately 5 seconds or more per reading.
- Scan all in rapid succession, make leaded and unleaded group. Take picture of leaded group and unleaded group. Take pictures of each leaded items.
- Inform family immediately of results for XRF Field Screening clearly indicating which foodware contains lead. Consider explaining lead on food-contact surface vs. not.
- Be mindful of substrate behind sample i.e. granite countertops may contain lead.
- Radioactive isotope-based XRF presents significant LOD barrier for consumer protection screening.
- **Limitations based on limit of detection.**



Sampling Considerations: Dust Wipe

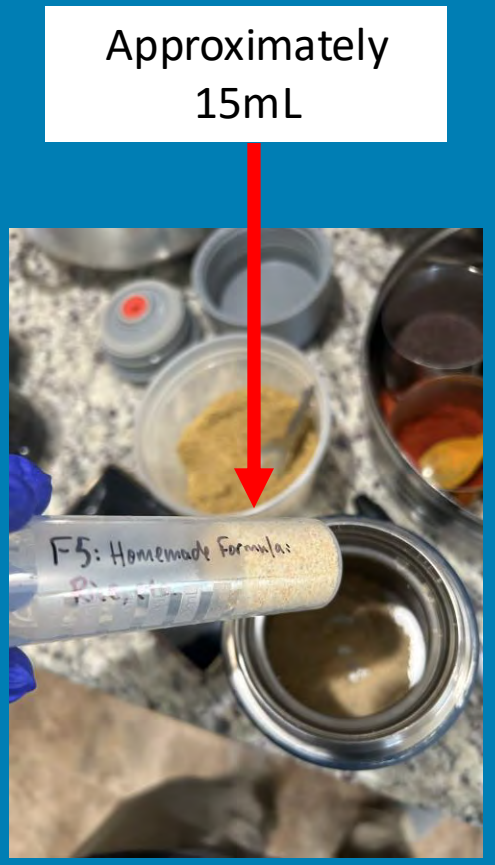
Dust wipes can give real exposure insight, but are only regulated for windowsills, window troughs, floors, and porches.

- Dust wipe sampling floor in front of Ghar mandir (Mandir, temple, pooja room, or shrine in home)
- Dust wipe sampling where child has access and powders are placed or spilled
- Toys, bedding, car interior, furniture hardware, Ghar mandir dishes, incense dishes, etc.



Sampling Considerations: Laboratory Analysis

- DASH Lab currently requires greater than 15mL of sample per accreditation protocol
- DASH Lab accreditation currently covers spices, teas, and supplements
  - Ongoing conversations to expand accreditations
- Units of Measure of Lead
  - Consider learning basics about industrial hygiene weights and measures: ppb, ppm, and visual representations of grams to determine likelihood of potential as source.
  - Consider guidance within this report.
  - Sample widely, bring samples to LIU workgroup, discuss what to send into lab.
- Tapping in Toxicology Colleagues
  - Cryptic cases and potential source feasibility



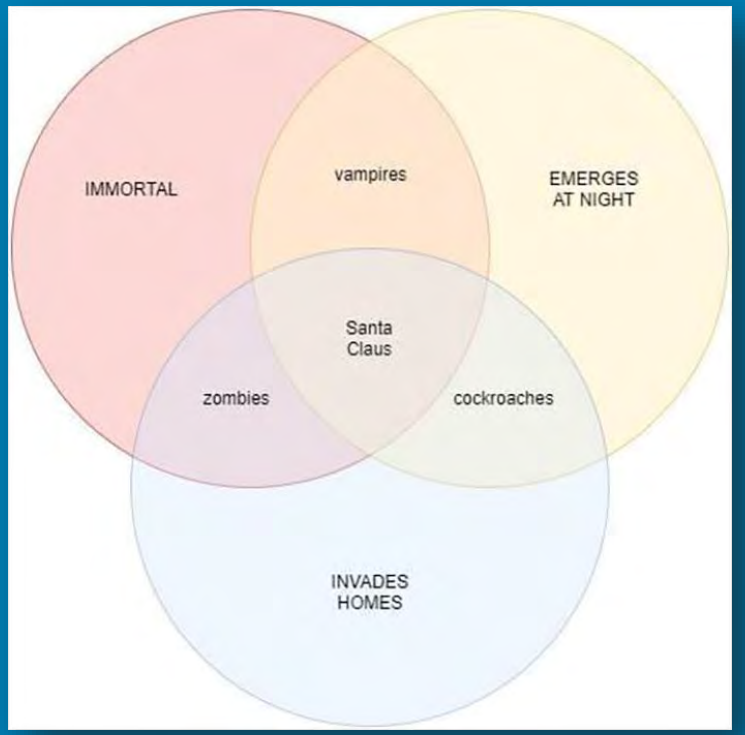
Making Recommendations: Investigator Insight and Table 6 Recommended Actions Column

Table 6: Non-regulated sample results & corrective action LIBRARY						
Sample ID #	**Surface/item description**	**Location**	**Material**	**Testing method**	**Result**	**Recommended corrective action**
Foodware/Cookware/Beverage Containers						
	Pot, Pan, Pot/Pan Lid, Plates, Saucers, Bowls, Pressure Cookers, Pitchers		**Metal**	**XRF**	> or equal to any significant amount (utilize precision settings) of lead.	All readily accessible foodware and cookware was screened with an XRF Analyzer. If there was a significant amount of lead in an item, the item was set aside in a designated area. Client was advised about which items contained lead. Recommended options for lead-containing cookware/foodware is: 1. Dispose of, or 2. Label as lead-containing and do not use for food or beverage, or 3. Conduct leach testing.

- Relevant Regulatory Thresholds and Guidance
  - ASTA Guidance Levels for Heavy Metals in Spices: 0.6 to 2.0 ppm depending on type of spice.
  - FDA Guidance for lead in cosmetics: 10 ppm
  - Others being compiled

Discussion

- Expanded communication between County PHN, State PHN, and EI Investigator
  - Non-paint sources of lead poisoning? Notify state PH Nurse and involve us
  - Always available for support and guidance as Non-paint lead exposure source specialist at Lead Inspection Unit: cullimorep@michigan.gov (Peterson Cullimore)
  - Further development of best science-backed recommendations LIU library for investigator insights and EI Table 6.
  - Nurse feedback and criticism of EI Reports welcome
- Product substitution: Lead-free product guidance to promote continuation of rituals, but with safe products. EWG, Lead-safe Mama crowd sourced laboratory analysis, etc.
- Family BLL insight



Send Us Data!

- CLPPP Reportable Limits for Recall Action coming soon.
- Any and all XRF/Laboratory Analytical Data from potential non-paint lead exposure sources: Please send it to us.
- What to include:
  - Pictures of product/packaging
  - Make/brand, product/model, lot number, net weight
  - MDHHS product category:
    - Spices, Teas, Dietary Supplements, Candies, Baby food and Infant Formula, Dairy Products (baby milk), Cereals / Dry grains / Flours, Home Remedies, Cosmetics
  - Analysis results: XRF reading or analytical laboratory certificate
  - XRF make/model if applicable
  - Place of purchase or website
  - Time of purchase
  - Any available usage/consumption information from parent/guardian, including the last time the product was consumed
  - MiClear Application or MiClear Patient ID (if available)
- MDHHS-CLPPP@michigan.gov and MillerR29@michigan.gov (RoseAnn Miller)

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- Potential future topics:
  - Lead Poisoning Prevention Professionals: Lead, Units of Measurement, and Guidance & Regulatory Thresholds
  - Environmental Investigator Series: Cultural Lead Exposure Sources: Central and South America
  - Open to recommendations

Questions?

- Previously submitted:
  - Lab accreditation and sample submission.
  - Data-informed EH health educators for large foreign or refugee populations (stores, community centers, etc.). See NYC.

"Never in all the years have we on Henry Street doubted the validity of our belief in the essential dignity of man and the obligations of each generation to do better for the oncoming generation.“ - Lillian Wald