

# **Global Alliance to Eliminate Lead in Paints**

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Prevention Branch, Chief**

June 21, 2011

# Why is lead paint still an issue?

- Paint containing lead has been and is still being used for decorating homes, schools, structures, toys, furniture, automobiles etc.
- Lead paint is still widely manufactured & sold for use in many developing countries.
- Exposure to lead from lead paint still occurs:
  - Exposure during manufacturing
  - Exposure from legacy paint & re-introduction of lead paint
  - Most common & concentrated sources of lead for children is from exposure to lead in paint and lead dust.
- We can prevent exposure to lead paint.

# What is lead paint?

- The term “paint” includes: varnishes, lacquers, stains, enamels, glazes, primers or coatings used for any purposes.
- “Lead paint” is paint to which lead compounds have been added.
- Lead compounds may also be present in paint as a contaminant from other paint ingredients. Current data from a number of countries suggests that lead levels in many decorative paints can be manufactured with levels at least as low as 90 ppm and often below 45 ppm.
- Efforts should be made to keep the total lead content in paints as low as possible.

# Background

- The International Conference on Chemicals Management endorsed the establishment of a global partnership to promote the phase-out of the use of lead in paint
- The partnership - The Global Alliance to Eliminate Lead in Paints (GAELP) - serves as contributors to the implementation of the Strategic Approach to International Chemicals Management
- United Nations Environment Programme and World Health Organization serve as co-secretariats of the Global Alliance (GAELP).

# GAELP goals and objectives

- The overall goal is to prevent children's exposure to lead via paint and to minimize occupational exposures to lead in paint.
- The broad objective is to phase out the manufacture and sale of paints containing lead and eventually to eliminate the risks from both new and legacy paint.
- Key activities areas are:
  - Raising awareness of lead toxicity
  - Guidance and assistance to identify potential lead exposure
  - Assistance to industry (manufacturers, wholesalers and retailers)
  - Prevention programmes to reduce exposure
  - Promotion of national regulatory frameworks.

# GAELP Focal Areas

- The Global Alliance has five key Focal Areas for organizing activities :
  - Health aspects
    - US Centers for Disease Control and the International Pediatrics Association
  - Environmental aspects
    - US Environmental Protection Agency and UN Environment Programme
  - Workers Health
    - International POPs Elimination Network
  - Legislation and regulations
    - University of Cincinnati and University of Lagos
  - Outreach to industry
    - International Paint and Printing Ink Council and OK Int'l

# GAELP meetings and events

- Meetings:

- May 2010: Initial Global Alliance meeting,
- March 2011 : Advisory group meetings
- March 2011: Initial outreach meeting
- April 2011: Presentation at the African Regional Meeting
- June 2011: Side event at the upcoming LAC meeting
- Summer 2011: SAICM open ended working group
- Fall 2011: 2<sup>nd</sup> Meeting of the Global Alliance

# GAELP Activities

- Ongoing Focal Area Activities:

- Information and tools for health education and outreach
- Recruiting contributors/partners to the work of the Global Alliance
- An evaluation framework for the efforts of the Global Alliance
- An international day of awareness for lead poisoning with a focus on lead in paint coordinated with US lead week
- A better picture of the uses of lead in paint by conducting a baseline survey

# Next Steps

- For additional information on joining the Alliance contact:

UNEP Chemicals Branch  
Division of Technology, Industry and Economics  
International Environment House  
11-13, Chemin des Anémones, CH-1219 Châtelaine,  
Geneva, Switzerland  
Fax (+41 22) 797 34 60  
E-mail: [noleadinpaint@unep.org](mailto:noleadinpaint@unep.org)

World Health Organization  
Public Health and Environment  
20, Avenue Appia  
CH-1211  
Geneva 27 Switzerland  
Fax (+41 22) 791 41 27  
E-mail: [noleadinpaint@who.int](mailto:noleadinpaint@who.int)

## GALEP website:

<http://hqweb.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/LeadPaints/tabid/6176/Default.aspx>

The findings and conclusions in this presentation are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

# **Lead Poisoning Outbreak Zamfara State, Nigeria May – June 2010**

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Healthy Homes and Lead Poisoning Prevention Branch

**National Healthy Homes Conference  
June 21, 2011**

“The findings and conclusions in this presentation have not been formally disseminated by the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry and should not be construed to represent any agency determination or policy.”

National Center for Environmental Health  
Division of Emergency and Environmental Health Services



# The Call

- ❑ **On May 8, 2010, CDC Healthy Homes and Lead Poisoning Prevention Branch was contacted**
  
- ❑ **Cluster of childhood illness and death in northwestern Nigeria**
  - **Characterized by convulsions and death**
  - **Majority of cases in children aged <5 years**
  - **Symptoms included nausea, irritability, and convulsions**
  - **Up to 200 children affected**

## **Initial Discovery March–April 2010**

- Médecins San Frontières (MSF) and State Ministry of Health officials**
  - **Noted more than expected cases of death and illness**
  - **Failed to respond to antibiotics and antimalarials**
  - **Visited 6 villages in March–April**
  - **Found >100 child-sized graves**
  - **Increasing numbers of ill children**
  
- Artisanal gold ore processing in the villages**
  - **Heavy metal poisoning considered as a potential source**
  - **Eight blood samples submitted for heavy metal analysis**
  - **Results indicated blood lead levels from 168–370 µg/dL**

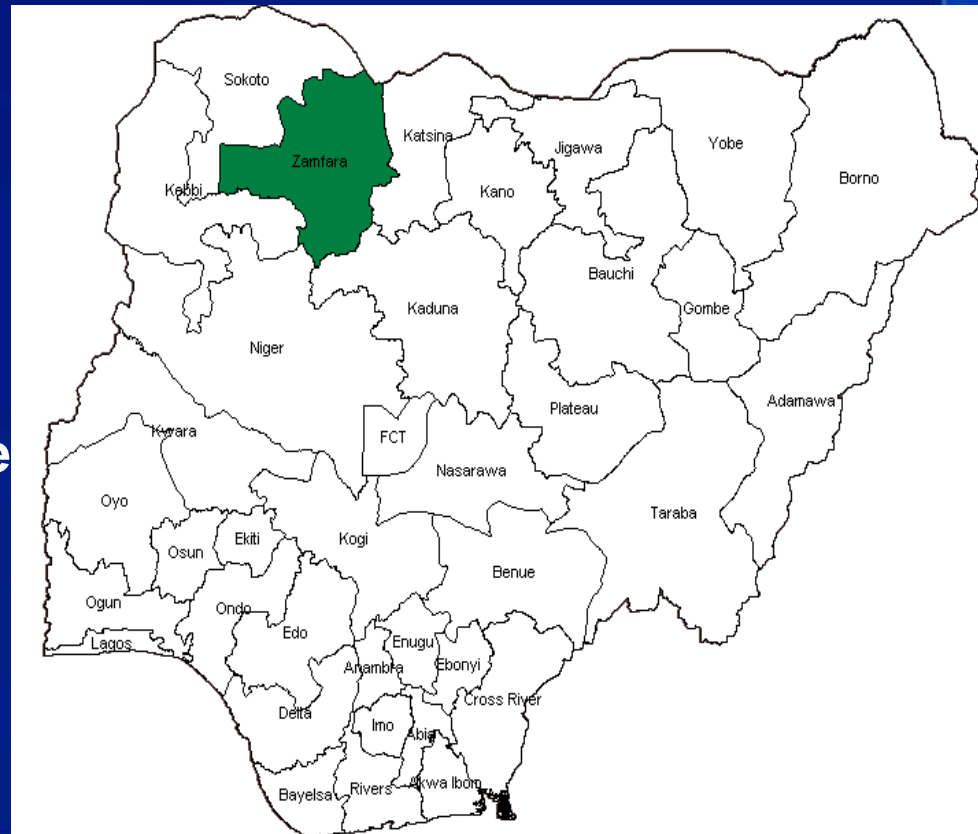
# Nigeria

- ❑ Population: 150 million
- ❑ Life expectancy: 47 years
- ❑ Per capita GDP: \$1,418
- ❑ Under 5 mortality rate: 186 / 1000



# Zamfara State

- ❑ **Population: 3.6 million**
- ❑ **Muslim**
- ❑ **Subsistence farming**
- ❑ **Rural**
  - **19% electricity**
  - **28% improved water source**
  - **28% sanitation facilities**
- ❑ **Mineral-rich state**





# Lead in the Environment

- ❑ **Sources of lead**
  - Mining operations
  - Gasoline
  - Paint
  - Food can solder
  - Batteries
  - Soil
  - Pottery
  - Toys
  - Traditional medicines
- ❑ **Routes of exposure**
  - Ingestion and inhalation



*Photo Source: James Durant*

# Lead Poisoning

## □ Children

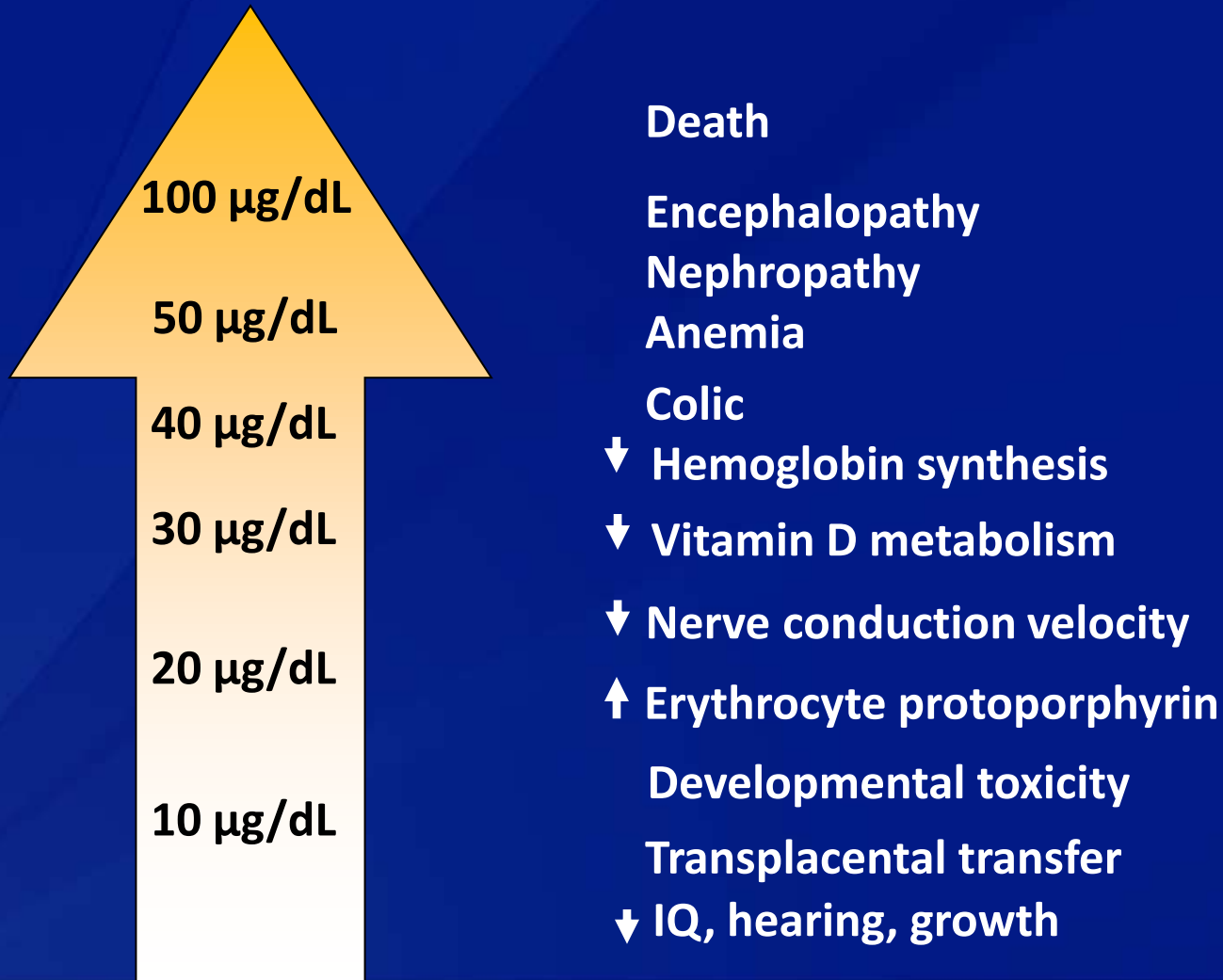
- Irreversible brain damage
- Behavior & learning problems
- Slowed growth
- Convulsions and death

## □ Adults

- Memory & concentration problems
- Kidney damage
- Reproductive problems

# Health Effects of Lead

Blood Lead Level (BLL) measured in  $\mu\text{g}/\text{dL}$  (micrograms/deciliter)



*Adapted from : CDC (2002) Managing Elevated Blood Lead Levels Among Children*

# Objectives

- ❑ **Verify diagnosis**
- ❑ **Determine the extent of lead poisoning in children aged <5 years**
- ❑ **Assess level of environmental contamination**
- ❑ **Identify risk factors for death from lead poisoning**
- ❑ **Recommend control measures**

# Methods

## □ Epidemiologic

- Cross-sectional household survey of two villages
- Survey collected information on children aged <5 years
- Participation in ore-processing and environmental exposures

## □ Laboratory

- Venous blood samples collected and analyzed

## □ Environmental

- Soil sample collected within family compounds

# Blood Lead Testing

- ❑ **Venous blood samples collected from children aged 2–59 months**
  - Every compound in Village A
  - Every other compound in Village B
  
- ❑ **Analysis on portable blood lead analyzer (LeadCare II)**
  
- ❑ **Two samples collected from every 3<sup>rd</sup> child**
  - Samples sent to CDC laboratory



*Photo Source: Antonio Neri*

# Environmental Sampling

- ❑ Sweep dust sample collected within compounds
- ❑ X-ray fluorescence spectrometer (XRF)
- ❑ Samples sent to the U.S. for analysis



Photo Source: Casey Bartram

## Description of Ore-Processing

- ❑ Villagers were participating in artisanal gold mining
- ❑ 6 processing steps

# Breaking



Photo source: Investigation team

# Grinding



Photo source: Investigation team

# Washing



*Photo source: Investigation team*

# Drying



*Photo source: investigation Team*

# Separating



*Photo Source: Investigation Team*

# Final product



*Photo Source: Investigation Team*

# Household Survey

<b>Village</b>	<b>Compounds Surveyed / Available</b>
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<b>Village A</b>	<b>54 / 54</b>
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<b>Village B</b>	<b>65 / 72</b>
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<b>Total</b>	<b>119/126</b>
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# Household Survey

<b>Village</b>	<b>Compounds Surveyed / Available</b>	<b>Children &lt;5 years alive in the last 12 mos</b>
<b>Village A</b>	54 / 54	259
<b>Village B</b>	65 / 72	204
<b>Total</b>	119/126	463

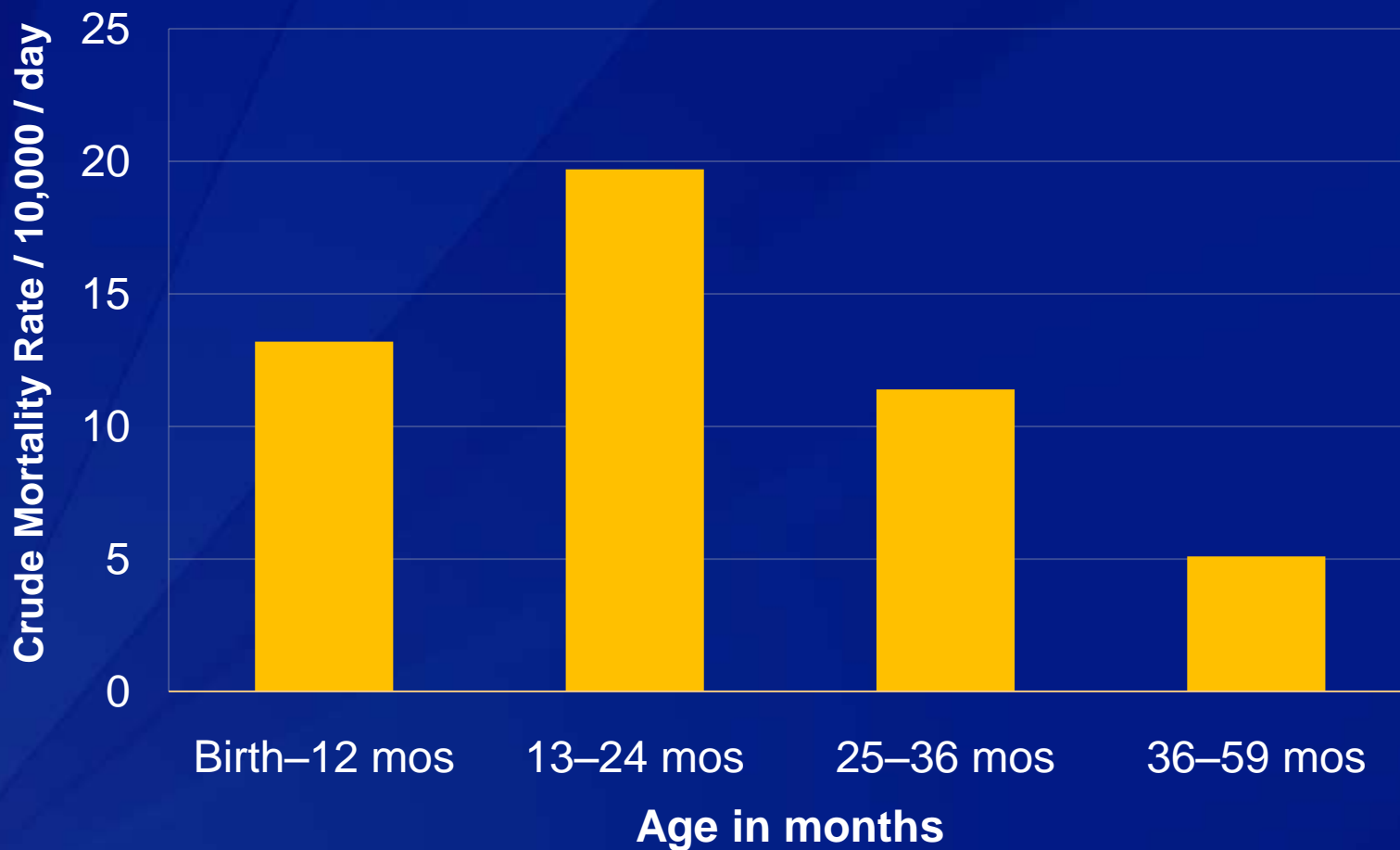
# Household Survey

<b>Village</b>	<b>Compounds Surveyed / Available</b>	<b>Children &lt;5 years alive in the last 12 mos</b>	<b>Deceased Children</b>
<b>Village A</b>	54 / 54	259	<b>78 (30)</b>
<b>Village B</b>	65 / 72	204	<b>40 (20)</b>
<b>Total</b>	119/126	463	<b>118 (25)</b>

# Household Survey

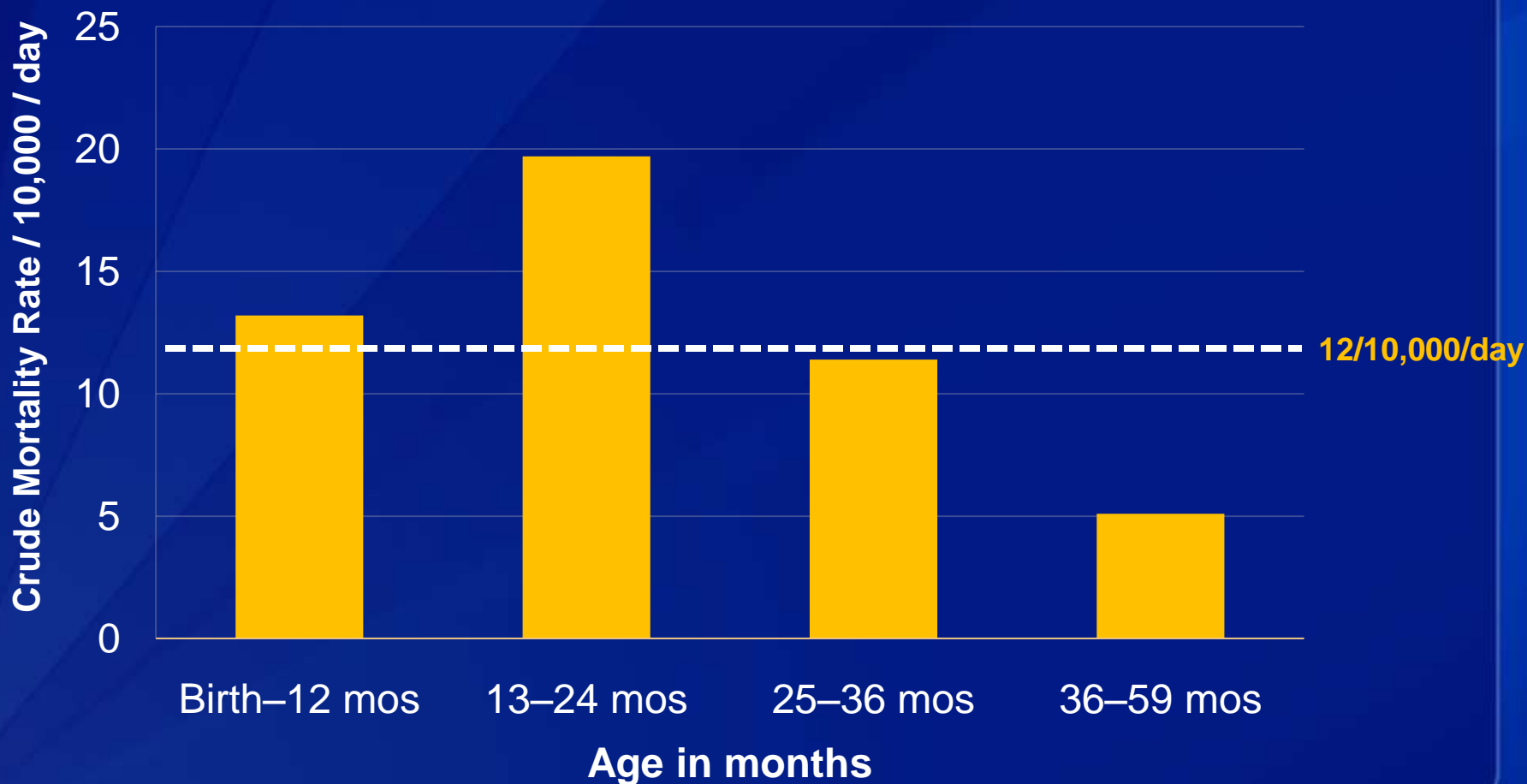
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<b>Village B</b>	65 / 72	204	40 (20)
<b>Total</b>	119/126	463	118 (25)
<b>Deaths in last 6 months</b>			<b>97 (82)</b>

# Age-Stratified 6-Month Under 5 Mortality Rate Village A and B, Nigeria 2010



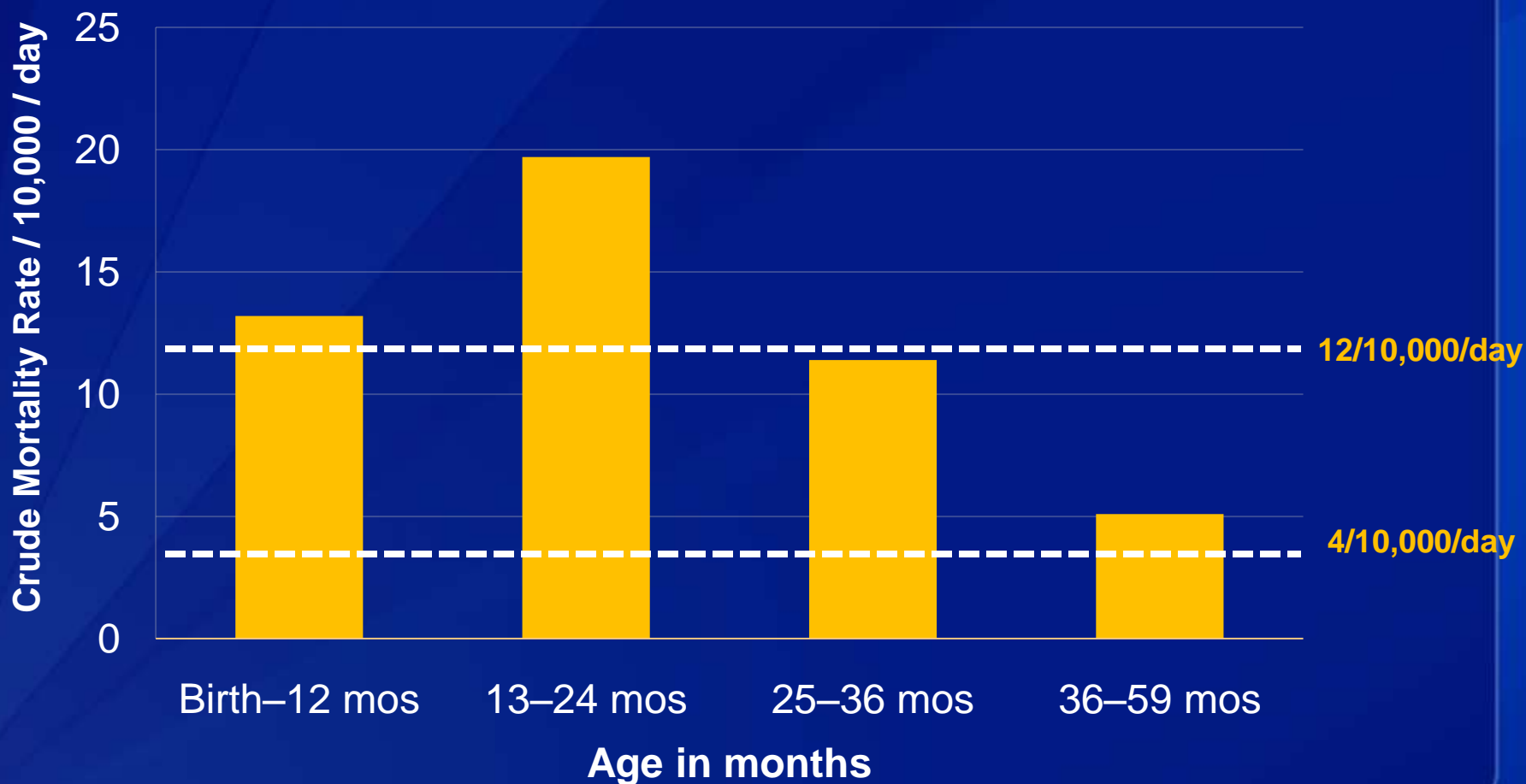
# Age-Stratified 6-Month Under 5 Mortality Rate Village A and B, Nigeria 2010

All children < 5 CMR = 12.19/ 10,000/ day



# Age-Stratified 6-Month Under 5 Mortality Rate Village A and B, Nigeria 2010

All children < 5 CMR = 12.19/ 10,000/ day



# Door-to-Door BLL Results

- ❑ **204 venous blood samples taken**
  - 100% indicated lead poisoning ( $\geq 10$   $\mu\text{g}/\text{dL}$ )
  - 97% met criteria for chelation therapy ( $>45$   $\mu\text{g}/\text{dL}$ )
  - 85% exceeded capacity of LeadCare II instrument ( $>65$   $\mu\text{g}/\text{dL}$ )
  
- ❑ **86 samples analyzed at CDC laboratory**
  - Mean blood lead level (BLL)
    - 153  $\mu\text{g}/\text{dL}$  in Village A
    - 108  $\mu\text{g}/\text{dL}$  in Village B
  - Range 36–445  $\mu\text{g}/\text{dL}$

## Activities Within Compounds

- ❑ **71% of compounds (84 / 118) participated in  $\geq 1$  activity inside their compound**
- ❑ **Mean number of activities performed within each compound: 4.0**
- ❑ **65% of compounds started ore-processing within the last 12 months**

# Environmental Soil Results

- **EPA soil-lead hazard**
  - $\geq 400$  ppm soil in child's play area
  - $>1200$  ppm soil in the rest of the yard
  
- **XRF results from soil (n=116)**
  - Range 45 to 100,000 ppm
  - 82% exceed EPA ref of 400 ppm

# Other Environmental Samples

## ❑ Other samples

- Water (n = 4) ranged from 37–1,300 ppb (EPA ref <15 ppb)
- Dust wipes (n=4) ranged from 1,600–78,000 ppm

## ❑ Gold ore rock (n = 5)

- ❑ Lead levels — 880–118,000 ppm

## ❑ Other metals

- Arsenic, copper, manganese, and mercury

# Significant Risk Factors

## □ Analysis (Bivariate and Multivariate)

- Children who died had greater odds having a mother who processed ore
- Some activities could be more dangerous than others (breaking and washing)
- Other important risk factors included
  - Age <2 years
  - Using communal well as a water source
  - Soil-lead levels within the family compound

# Underlying Causes of the Outbreak

**Convulsions and Death**

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**Children with Lead Poisoning**

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**Children with Lead Poisoning**



**Villages / compounds with Lead Contamination**

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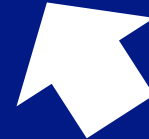
**Children with Lead Poisoning**



**Villages / compounds with Lead Contamination**



**Ore-processing**



**High Lead Content**

## Why Now?

- ❑ **65% of people who processed reported stating in the last 12 month period**
- ❑ **Most grinding machines were recently purchased**
- ❑ **Rising price of gold in the global market**

## **Immediate Recommendations**

- ❑ Initiate chelation therapy to treat lead poisoned children**
- ❑ Identify and remediate contaminated areas**
- ❑ Provide health education**
- ❑ Control mining activities**

# Updates

## ❑ **Medical management**

- 1000 children chelated (prior 42% CFR)
- Focusing on outreach activities to provide treatment in remediated villages

## ❑ **Environmental testing and remediation**

- 7 villages remediated
- Sampling in additional villages

## ❑ **Extent of lead contamination/poisoning**

- 73 villages surveyed,

## ❑ **Capacity building/ long term actions**

- Underway with multiple national/international organizations

# Acknowledgments

- Nigeria Federal Ministry of Health
- Zamfara State Ministry of Health
- Anka local government
- Bukkuyum local government
- Maru local government
- United Nations
- World Health Organization
- Médecins Sans Frontières
- Terragraphics/Blacksmith Institute
- Nigerian FELTP
- USAID
- Chris Howard
- CDC CGH & GDD
- Kevin DeCock
- Derek Hardy
- Ray Arthur
- CDC Nigeria
- Lora Davis
- CDC/NCEH DLS
- Robert Jones
- Kathleen Caldwell
- Jeff Jarrett
- Charles Dodson
- CDC EOC Logistics/Travel
- George Roark
- Pamela Clark
- Keicia Reeves
- Patrice Smith-Redmond
- CDC/ATSDR
- Ed Murrery
- Jim Holler
- James Durant
- Steve Bullard
- Brian Lewis
- CDC NCEH & HHLPPB
- Mary Jean Brown
- Antonio Neri
- Taran Jefferies
- Barry Brooks
- Claudine Johnson
- Jay Dempsey
- Wanda Wilson
- CDC EIS
- Sheryl Lyss
- Andrew Medina-Marino
- CDC / IHS
- Lori de Ravello
- CDC CEFO
- Douglas Thoroughman

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



## Blood Lead Results

	<b>Village A Mean (range)</b>	<b>Village B Mean (range)</b>	<b>Reference level</b>
Lead (µg/dL)	153.3 (55.9–331)	107.5 (36.5–445)	≤ 10
Mercury (µg/L)	2.4 (0.39–6.6)	1.4 (0.4–6.5)	~ < 10
Manganese	14.0 (4.0–39.0)	20.9 (4.9–40.8)	7.7–12.1
Cadmium (µg/L)	< LOD	0.2 (0.2–0.27)	?

# Logistic Regression

## □ Logistic regression

- Exposures of interest: ore processing activities and other environmental exposures
- Outcome of interest: child death

## □ Model development

- Checked for correlation between variables
- Used backward selection of bivariate variables with a  $p < 0.1$
- Remained in final model if  $p < 0.05$

# Chelation Therapy

- ❑ **Medication called DMSA**
  - Administered twice a day for 28 days
- ❑ **Expensive**
- ❑ **Not readily available in Nigeria**

## Children with History of Convulsions

- ❑ **17% (58 / 345) of living children with history of convulsions**
- ❑ **82% (97 / 118) of deceased children with history of convulsions**

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