



EVIDENCE THAT WORKPLACE INTERVENTIONS REDUCE CHILDREN'S LEAD EXPOSURE

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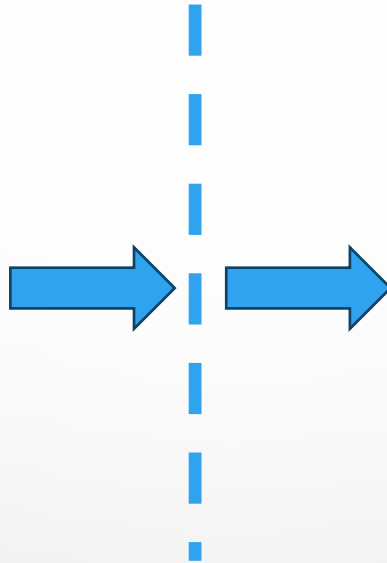
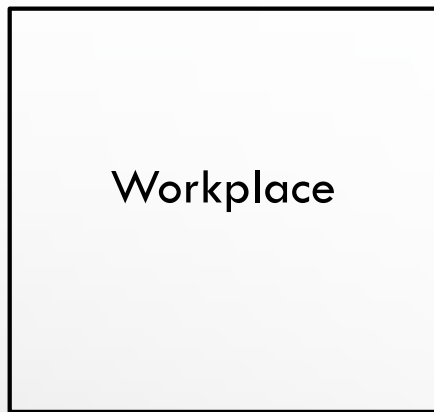
CONFLICT OF INTEREST DISCLOSURE STATEMENT

- CGD provided travel support for this conference.
- Perry Gottesfeld serves as an expert witness on cases regarding lead poisoning.



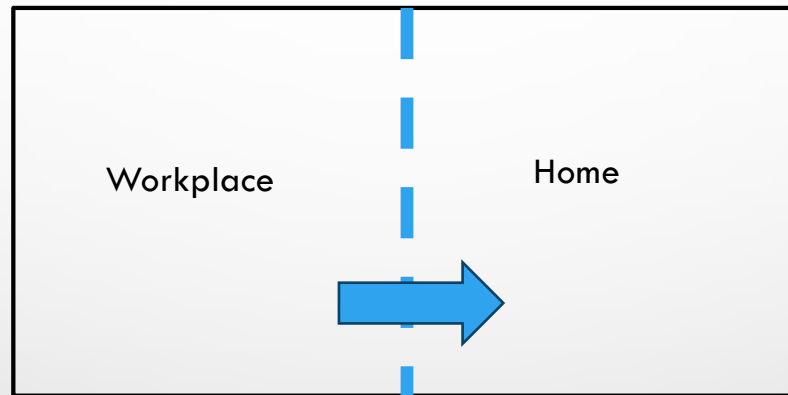
Workplace

Home



- Dust on clothing and shoes
- Contamination of automobiles
- Dust on skin and hair
- Pregnancy (pre-term births, low birth weight)
- Breastfeeding

HOME BASED WORK



OCCUPATIONS WITH TAKE-HOME LEAD EXPOSURES

- MINING
- FIRING RANGES
- LEAD BATTERY RECYCLING
- LEAD BATTERY MANUFACTURING
- RADIATOR REPAIR
- OIL FIELD WORKERS
- BOATYARD WORKERS
- CONSTRUCTION
- AUTOMOTIVE REPAIR
- LEAD OXIDE MANUFACTURING
- MANUFACTURING LEAD FISHING SINKERS AND BATTERY POSTS
- SHIPYARD
- WINDOW RESTORATION
- POTTERY/ CERAMICS
- SMELTER
- STAINED GLASS

Note: 60% of workers are in the informal sector without any occupational health protections!

TAKE HOME EXPOSURES

- Identified 80 Reported Incidents of Workers' Families Exposed to Lead as documented in more than 60 published studies.
- Cohort Studies Have Found That Lead Exposed Workers' Children Had Significantly Higher Blood Lead Levels Than Controls After Controlling for Relevant Nonoccupational Factors.
- Lead Contamination of Workers' Homes Resulting In Elevated Blood Lead Levels of Children is **“A Substantial Problem In The United States.”**

National Institute for Occupational Safety and Health (NIOSH). 1995. Report to congress on workers' home contamination study conducted under The Workers' Family Protection Act (29 U.S.C. 671a).

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In the U.S. about 10% of all children with elevated blood lead levels have a parent with workplace lead-exposure!

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EXAMPLE OF LEAD BATTERY RECYCLING (USA)

- Puerto Rico Department of Health conducted Blood Lead Level (BLL) surveillance in head start (pre-schools) and found 3 children with levels $\geq 10 \mu\text{g}/\text{dl}$ with common link to family members employed at battery recycling firm.
- Follow up testing of workers at the plant: mean BLL of $30.7 \mu\text{g}/\text{dl}$;
- Follow up screening of workers children identified 11 additional children (16%) with BLL levels $\geq 10 \mu\text{g}/\text{dl}$ and 28 (41%) with 5-9 $\mu\text{g}/\text{dl}$;
- Dust lead levels in employee vehicles and home exceeded $40 \mu\text{g}/\text{ft}^2$; (note: current action level is $5 \mu\text{g}/\text{ft}^2$)

CASE STUDY GOLD MINING (NIGERIA)

- IN 2010 DOCTORS WITHOUT BORDERS/ MEDECINS SANS FRONTIERES (MSF) IDENTIFIED VILLAGES IN ZAMFARA NIGERIA EXPERIENCING EXCESSIVE CHILD MORTALITY DUE TO LEAD POISONING FROM ARTISANAL, SMALL-SCALE GOLD MINING.
- 700 + DEATHS (25% OF CHILDREN UNDER 5) AND THOUSANDS POISONED.
- SOIL REMEDIATION IN 7 IMPACTED VILLAGES;
- THEN IN 2015 A SECOND OUTBREAK IN NIGER STATE;
- MSF HAD TREATED THOUSANDS OF LEAD POISONED CHILDREN.
- PARTNERSHIP WITH OK INTERNATIONAL TO REDUCE WORKPLACE AND COMMUNITY EXPOSURES.





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STRATEGIES TO REDUCE LEAD EXPOSURES

- TWO BASIC STRATEGIES:
 1. CONVERT DRY MINING AND PROCESSING TO USE WET METHODS.
 2. INTRODUCE “SIMPLE” MEASURES TO REDUCE TAKE HOME EXPOSURES:
 - CHANGE OUT OF WORK CLOTHING
 - SEPARATE EATING AREAS
 - HANDWASHING
 - SHOWERING
 - PROVIDE SECURE ORE STORAGE AREAS AWAY FROM HOUSING
- TRAINING MINERS AND COMMUNITIES
- ESTABLISHED HEALTH AND SAFETY COMMITTEES

INTRODUCED WET METHODS FOR ORE PROCESSING:

- AVERAGE AIRBORNE LEAD LEVELS WERE REDUCED BY **95%**

Gottesfeld, P., Tirima, S., Anka, S. M., Fotso, A., & Nota, M. M. (2018). **Reducing Lead and Silica Dust Exposures in Small-Scale Mining in Northern Nigeria.** *Annals of work exposures and health*, 63(1), 1-8.



Safer
Practices
Hygiene



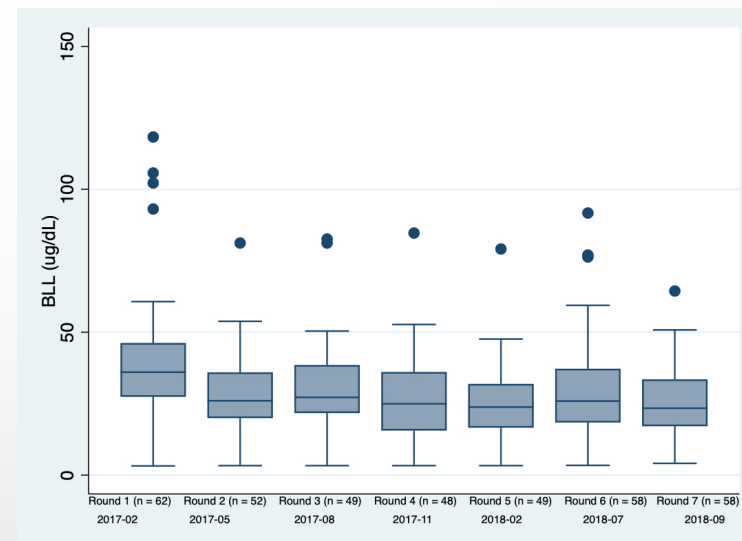
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BOTTOM LINE: EXPOSURE REDUCTION

- MEDICAL SURVEILLANCE OF 58 RANDOMLY SELECTED MINERS AND PROCESSORS TO VOLUNTARILY PROVIDE QUARTERLY BLOOD SAMPLES TO TEST FOR LEAD;
- **32% REDUCTION** IN MEAN BLOOD LEAD LEVELS OVER 19 MONTHS FROM 31.6 TO 21.5 $\mu\text{g}/\text{dl}$.



Gottesfeld P. et. al. Declining Blood Lead Levels Among Small-scale Miners Participating in a Safer Mining Pilot Program in Nigeria, *Occupational and Environmental Medicine*, 76.11 (2019): 849-853.

KEYS TO SUCCESS

- LOW-COST SOLUTIONS
- TRAINING HUNDREDS OF MINERS AND COMMUNITY MEMBERS
- BUILDING TRUST: PARTICIPATION OF THE LEADERSHIP FROM GOVERNMENT, RELIGIOUS AUTHORITIES, TRADITIONAL LEADERS AND MINERS
- COMMUNITY PARTICIPATION AND INVESTMENT:
 - ✓ MINERS PROVIDED FUNDS FOR EQUIPMENT INCLUDING A PUMP FOR BORE WELL AND GENERATOR;
 - ✓ MINERS PROVIDED LABOUR FOR CONSTRUCTION OF EATING AREA, CHANGE AREA, SHOWER, ETC.
- HEALTH AND SAFETY COMMITTEES SERVED AS AN ONGOING ACCOUNTABILITY MECHANISM.

CONCLUSIONS

- MINERS CARE ABOUT THEIR HEALTH.
- IT IS POSSIBLE TO SIGNIFICANTLY REDUCE LEAD AND SILICA DUST EXPOSURES IN ARTISANAL MINING WITHOUT DESTROYING THE ECONOMICS.
- PREVENTION IS NOT POPULAR AMONG GLOBAL HEALTH FUNDERS BUT IT IS EFFECTIVE.
- **WE HAVE A PROVEN MODEL TO BE TAKEN TO SCALE!**



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