Environment Protection Authority

Managing children's blood lead levels in Broken Hill, NSW

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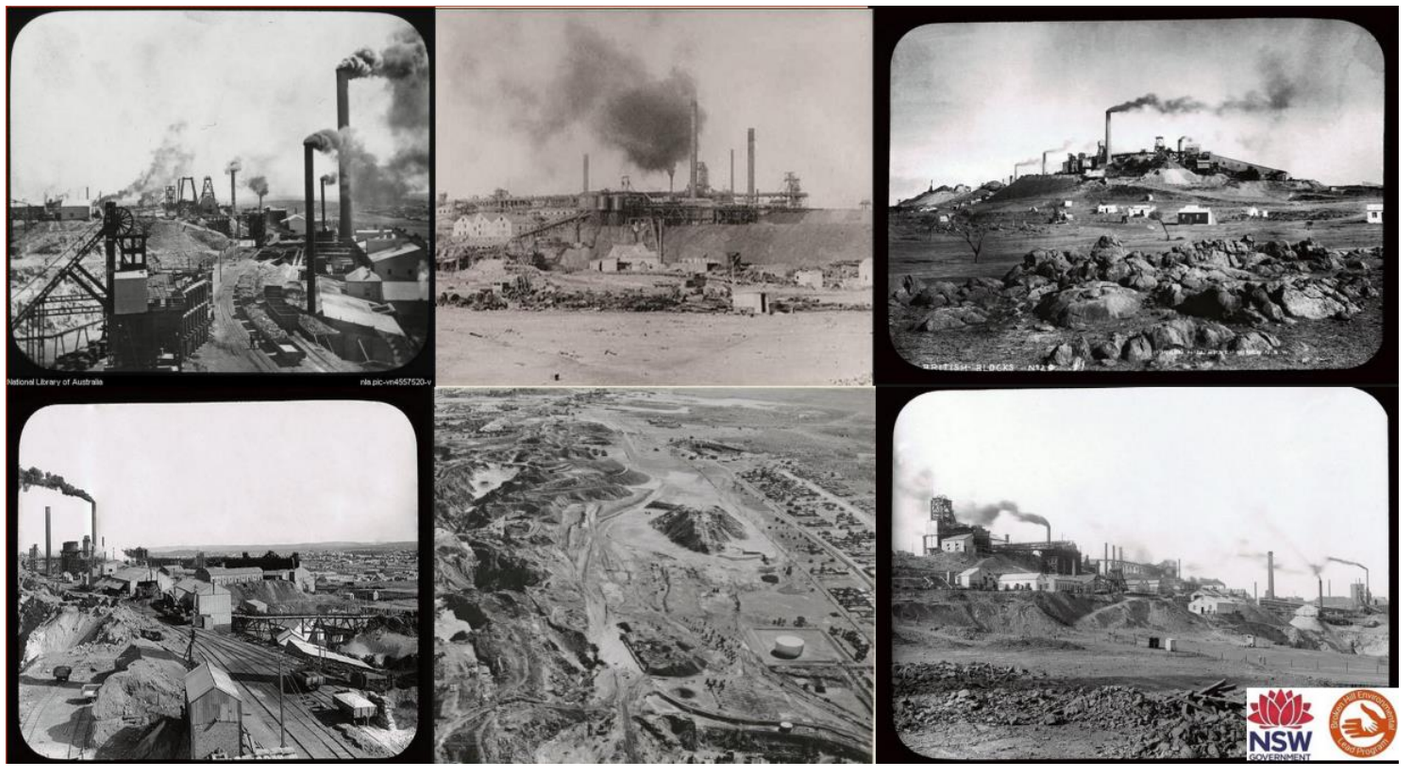
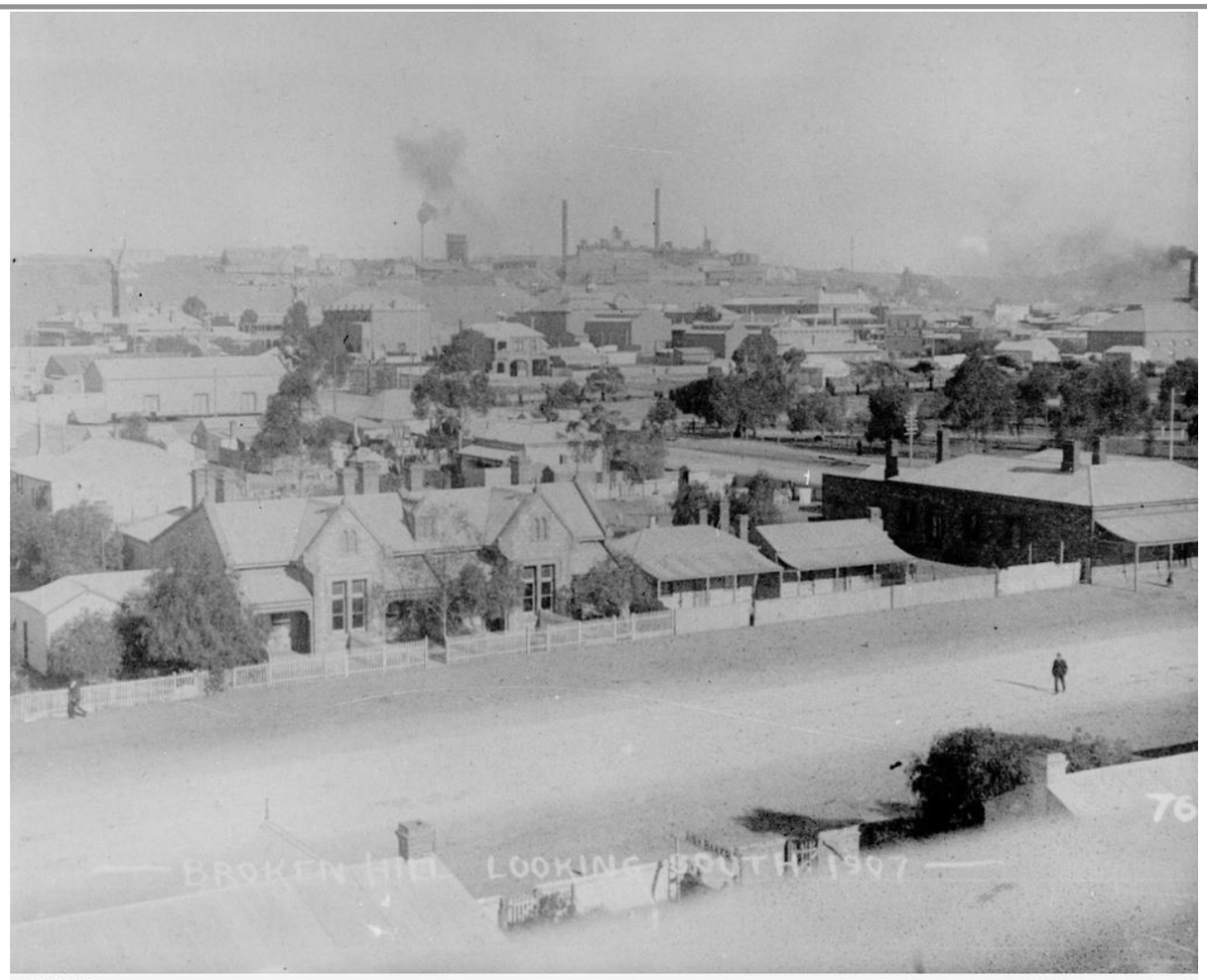
Topics

- Background
- Sources of lead exposure
- Blood lead levels in Broken Hill
- Lead management in Broken Hill
- What we've learnt from other lead management programs
- Current challenges



- Mining since 1883
- Silver initially, then lead
- Smelting until 1898
- Multiple changes of company ownership
- Currently 3 mines (2 companies)

Headlines



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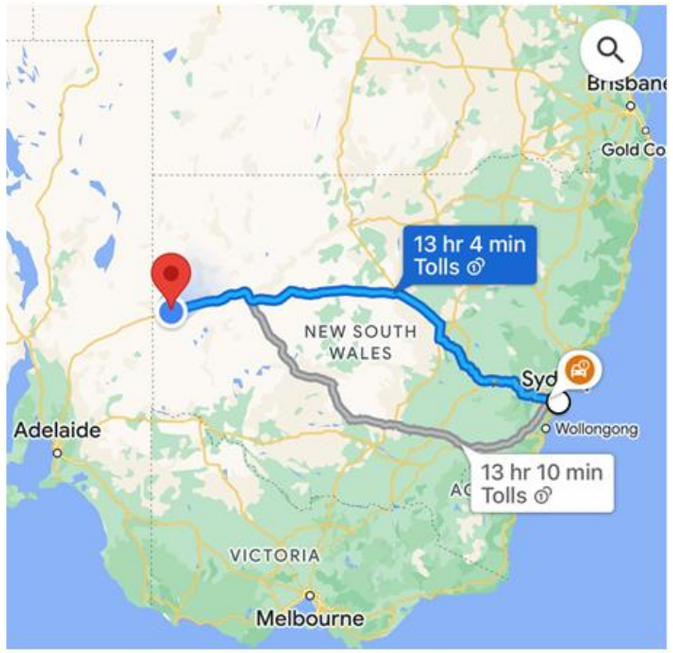
- The town grew up around the Line of Lode (ore body) and physically surrounds it

- Homes and child care centres within 100m of the Line of Lode

Broken Hill

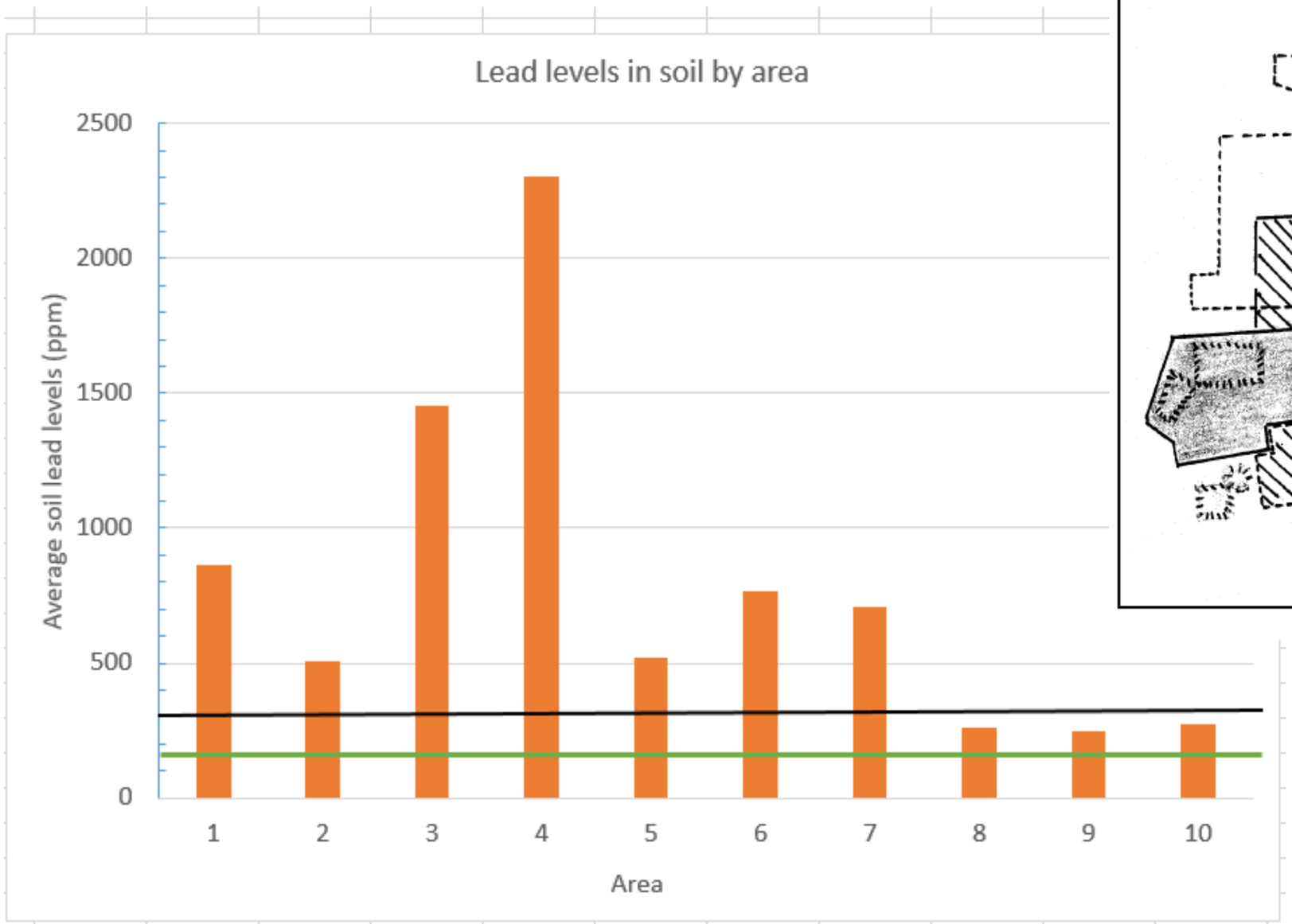


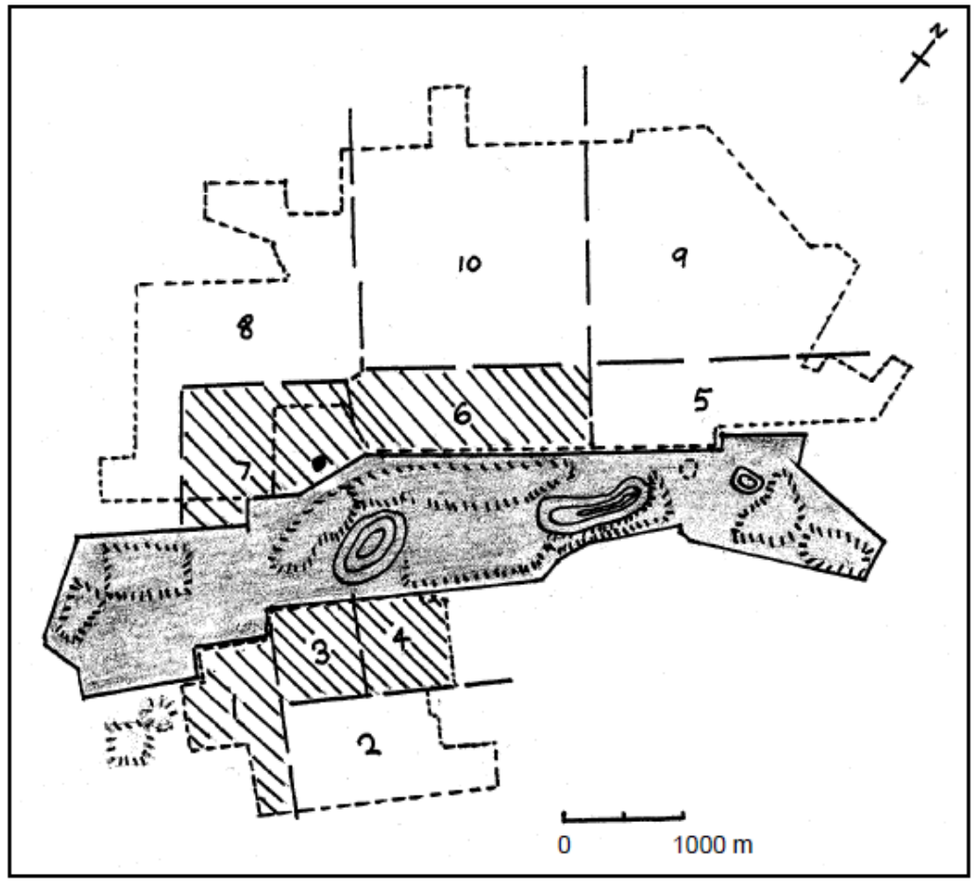
- Remote – 2 day drive from state capital
- Current population 17,661
- Major industries 2021
  - Health care/social assistance (21.8%)
  - Mining (11.0%)
  - Retail (10.8%)
- Semi arid –
  - Av rain 259.7 mm
  - Range 58 – 714 mm
  - Av max 15.7 – 33.7 ^{0}C
  - Av min 4.8 – 19.3 ^{0}C
  - Range -4.6 – 46.3 ^{0}C

- Climate of extremes – dust storms to intense rains

- High blood lead levels identified as a significant public health issue for young children in Broken Hill in 1991
- Majority of homes have soil lead levels above 300 mg/kg (HIL residential soils)
- Majority of Broken Hill homes built before 1970 and likely to have issues with lead-based paint

- Soil lead levels

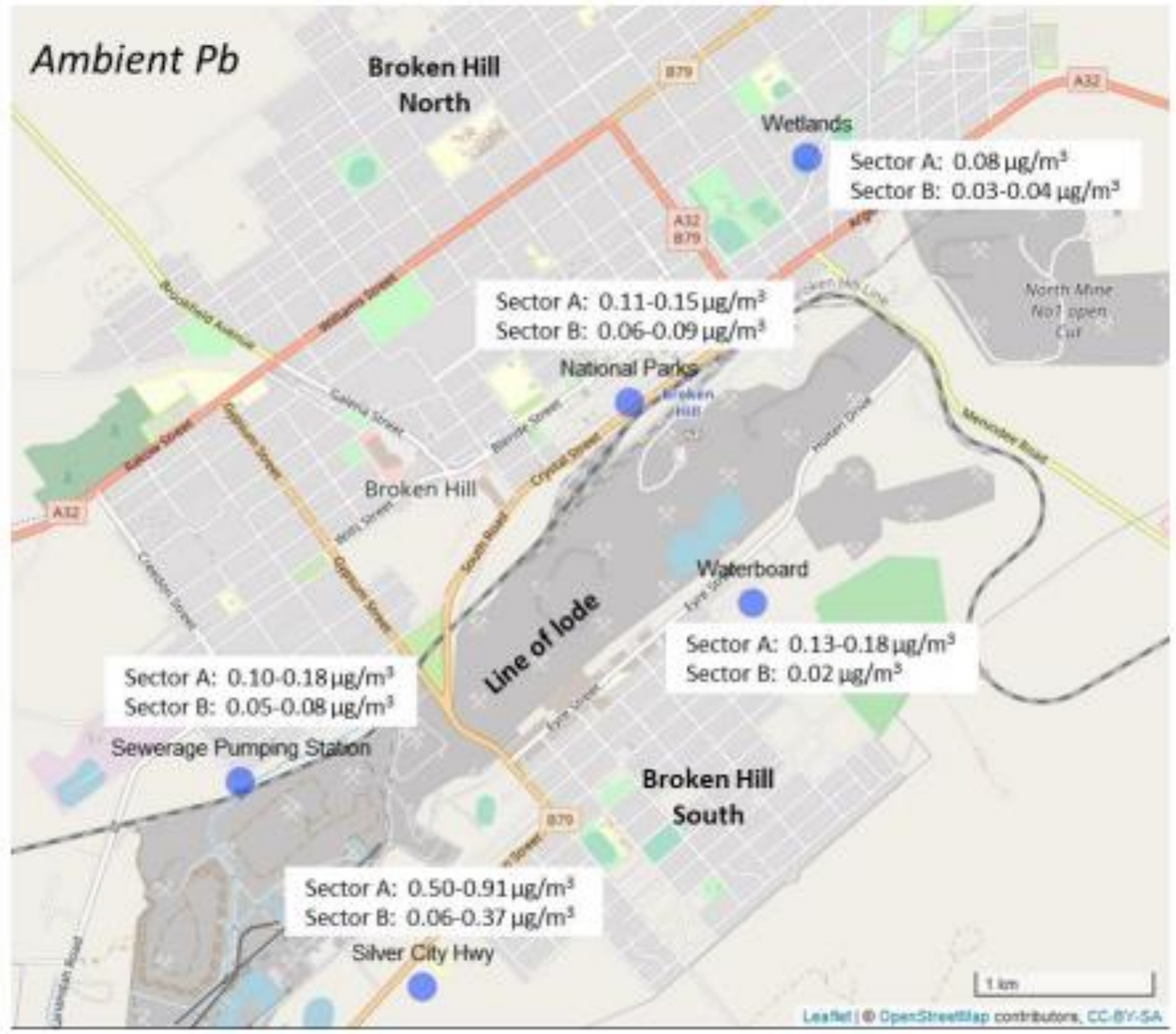




Boreland et al *Australian and New Zealand Journal of Public Health* 2002, 26(3):203-207.

Ambient lead levels

- Lead levels 2 – 3 X higher when wind from Line of Lode
- Higher closer to Line of Lode



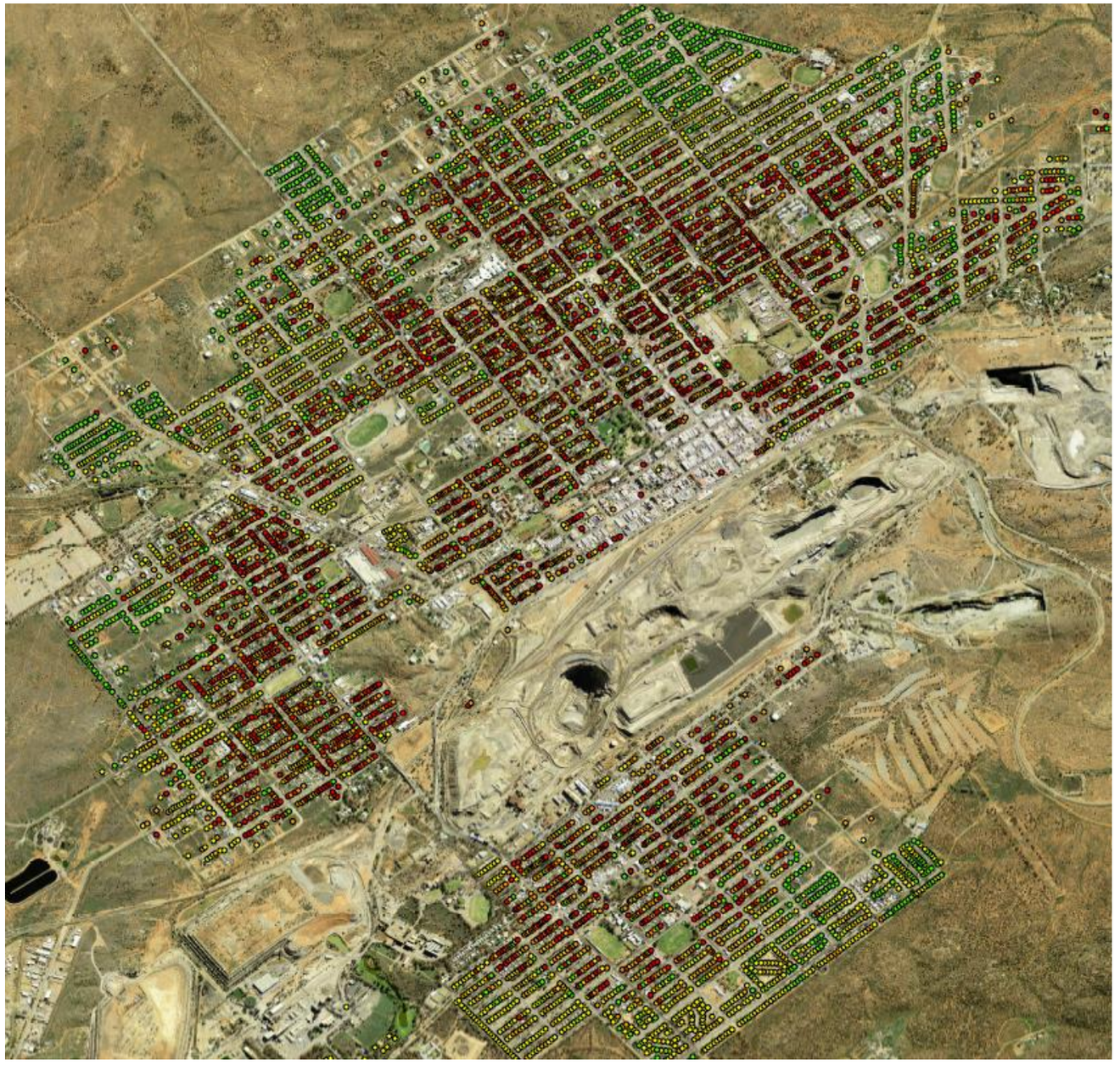
- Oldest homes closest to Line of Lode

Red = pre 1914

Orange = 1915 – 1939

Yellow – 1940 – 1970

Green = 1971+



Other risk factors:

- Social disadvantage
- Apathy from locals “I grew up with it and I’m fine”
- High turnover of key professionals – eg GPs, medical staff, teachers, dentists, emergency services etc
- **Overlapping risk factors** people with a higher level of social disadvantage tend to live closer to the Line of Lode on land that is highly contaminated, in houses in poorer condition, and with high levels of lead paint. These people have few resources and face the biggest challenges

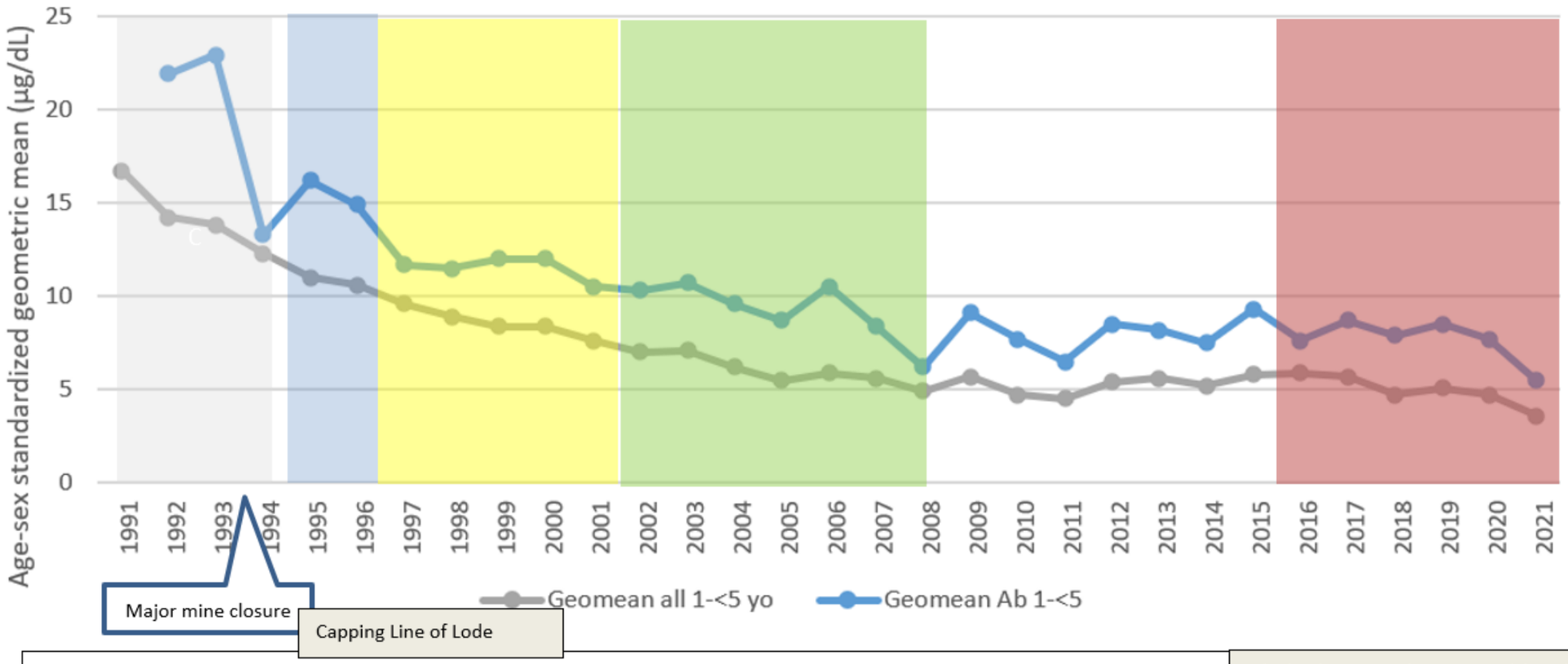
Lead management

Lead management in Broken Hill:

- Comprehensive free voluntary screening program since 1991
  - 12 - < 60 month old children: since 1991 – estimated participation rate > 80%
  - 6 < 12 months: 2000 – 2012 and 2018 to present
  - Cord blood of babies born at BH hospital: 1996 to present
- Education and awareness
- Remediation of homes and public spaces
- Research and evaluation

➢ Minimise emissions (dust and sediment) from Line of Lode and adjacent rail corridor

Age-sex standardized geometric mean blood lead level for All 1 - < 5yo children, and 1 - < 5yo Aboriginal children

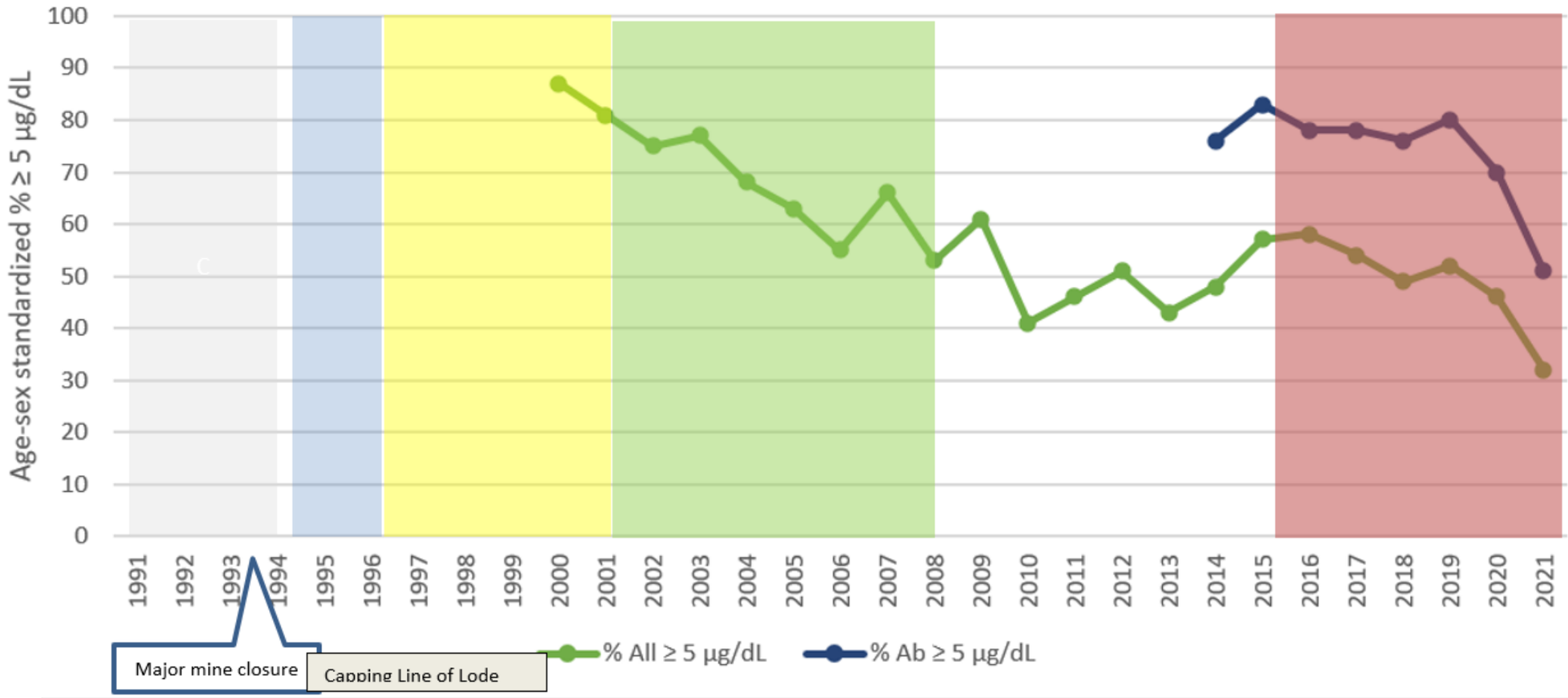


- Grey box – initial discovery and investigation of sources of exposure
- Blue box – Short Term Strategy (1st BHELP) – blood lead testing, trial home remediation, public land rem
- Yellow – Long Term Strategy (1st BHELP extension) as above
- Green – integration strategy- mostly blood lead testing, small amount remediation
- White – blood lead testing and minimal promotion, very limited/no remediation
- Reddish – BHELP # 2

Likely driver reduction in blood lead 1991 – 2000 is significant reduction of mining output and capping of Line of Lode.

Maybe starting to see reduction in blood lead since 2018.

Age-sex standardized percent of All 1 - < 5yo children, and 1 - < 5yo Aboriginal children, with blood lead levels ≥ 5 µg/dL



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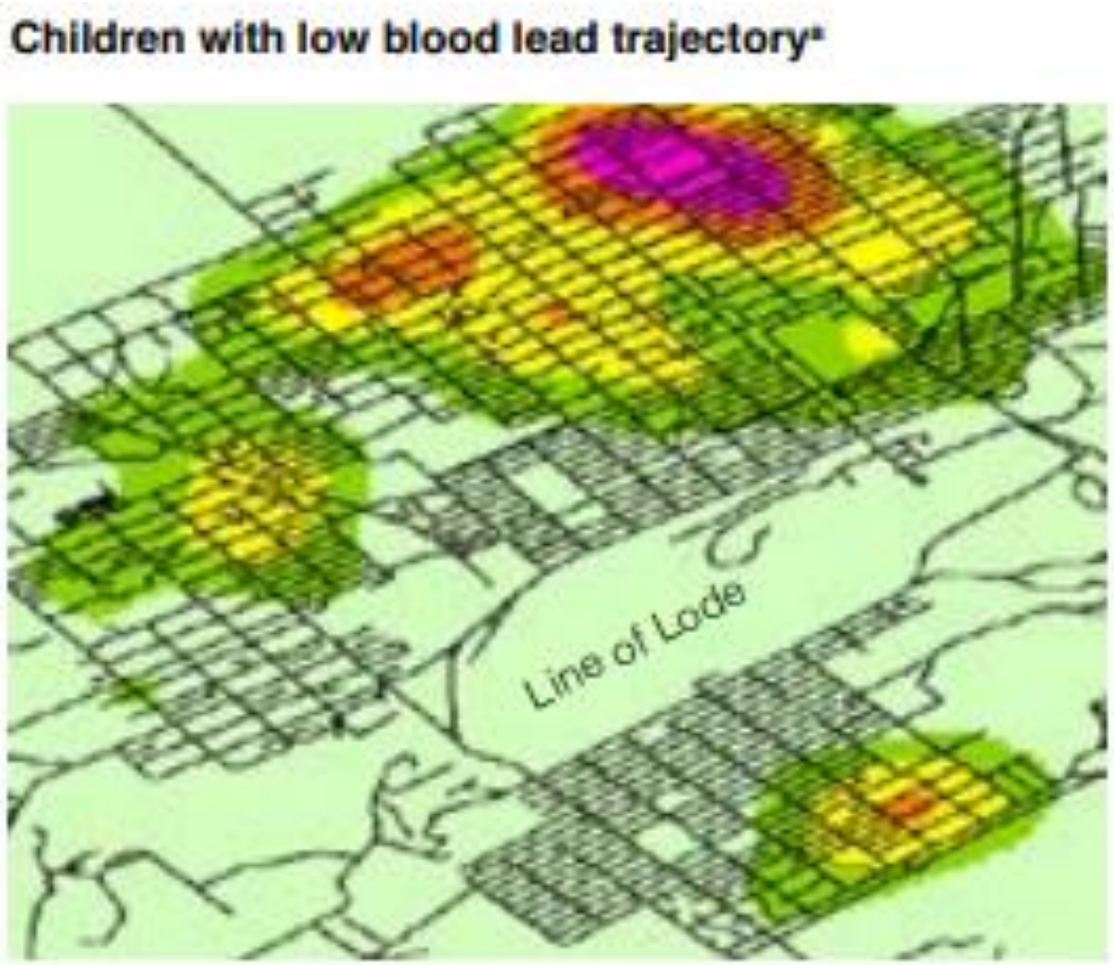
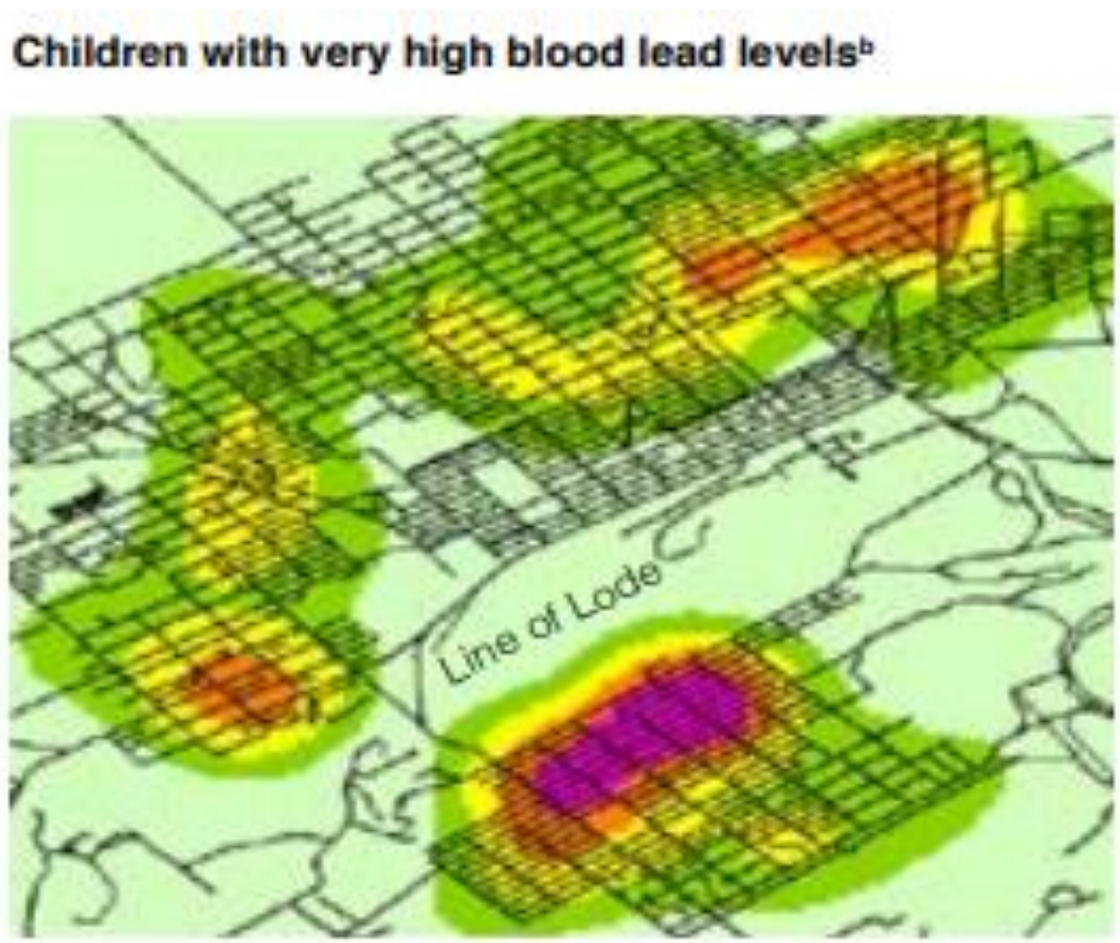
Maybe starting to see reduction in percentage ≥5 µg/dL since 2018.

Longitudinal blood lead study

- About 1/3 children stay below 5 µg/dL

About 1/3 children have at least 1 test of 10 µg/dL or more





Lyle et al, Public Health Res Pract. 2021; https://doi. org/10.17061/phrp31122107.


Lead Smart
Broken Hill


Our town,
Our kids,
Our future
Lead Smart
Broken Hill
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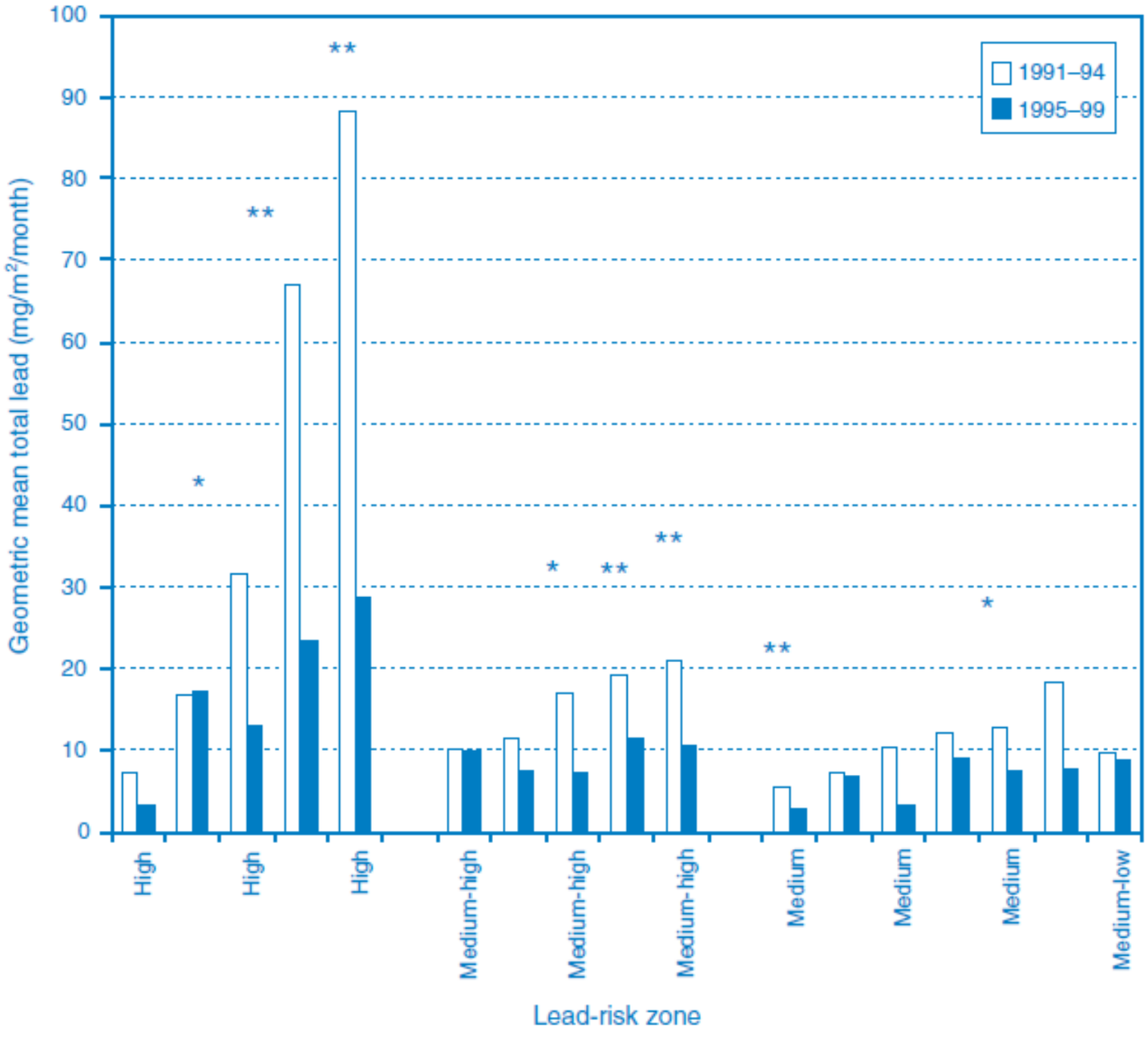
Example 1: Owner-occupied. 2 yo, PbB > 15 ug/dL, home well sealed against dust entry, but soils to 3,605 mg/kg.

Example 2: Rental. 1 yo, PbB > 10 ug/dL. Blood lead levels rose rapidly after moving into property. Home well sealed internally and internal paint and floors in good condition, but high lead in some soil and very high lead paint (<5%) in very poor condition on back wall flaking onto child play area.

Example 3: Owner occupied. 18 months, PbB 10-14 ug/dL, soils to 670 mg/kg; paint to 5 %. Poorly sealed in back lobby.

- Mine closures in the early 1990s and capping the Line of Lode in the mid 1990s significantly reduced lead levels in dust.

- This probably caused most of the reduction in blood lead levels seen during the 1990s.



Boreland et al. *NSW Public Health Bulletin* 2008; 19(9-10):174-179.

What we've learnt from other programs:

- Iterative approaches to understanding sources of exposure and a continuous improvement approach to reducing lead exposure are common
- Very important to have genuine buy-in from all stakeholders (industry, community, government) – developing it takes time
- Adequate resources (leadership and funding) are essential
- Possible to have all children within guidelines and still have lead industry
- Strong emission controls and broad community clean-up more effective than individual approaches

Current challenges:

- Funding – historically has only been supported in 3 – 5 year tranches, when a longer timeframe was required, and is currently unfunded
    - Strenuous activity on part of NSW EPA to secure ongoing funding for BHELP and an integrated solution that deals with all the exposure pathways
- Recent evidence that emissions from Line of Lode, although much reduced, are still impacting children's blood lead levels – but mines are meeting their current licence conditions
- Potential reduction of blood lead threshold to 3.5 µg/dL
- Competing visions/requirements among government departments for final form of remediation of Line of Lode (Heritage, public safety etc)
- Widespread contamination of residential soils and most our homes built before 1970 – clean up very costly
- Potential significant increase in population due to several upcoming large mining projects within driving distance of Broken Hill
- Need co-ordinated whole of govt approach to minimising emissions and cleaning up contamination – is looking more likely than in recent years