Trends in lead exposure in a rural mining town in South Africa, 1991 - 2008

To the Editor: Lead exposure through mining processes contributes significantly to environmental and human contamination worldwide.[1-3] Studies have shown that there is no safe level of exposure, and very low levels (blood lead levels <5 µg/dL) have resulted in neurocognitive and behavioural abnormalities in children.[4] This has detrimental economic and social consequences, especially in low- and middle-income countries where resources to mitigate the effects of lead exposure are limited.[5] In 1991, 2002 and 2008, cross-sectional surveys assessing lead exposure were conducted in grade 1 children in a remote lead-mining town (Aggeneys) and a control town (Pella) about 40 km away in the Northern Cape Province, South Africa (SA). Blood lead levels (BLLs) were assessed in whole-blood samples using atomic absorption spectrophotometry in 1991 and 2002 and in capillary blood using the LeadCare 1 analyser system in 2008.[6,7]

The sociodemographic profiles of the study children remained similar from 1991 to 2008 (Table 1). Socioeconomic status was higher in Aggeneys than in Pella. However, despite the higher socioeconomic status in Aggeneys, the grade 1 children's mean BLLs were significantly elevated in all three surveys. Between 1991 and 2002 the mean BLL dropped by approximately 50%, but did not fall significantly thereafter. The initial decline between 1991 and 2002 may have been due to the phasing out of leaded petrol from 1996, since declines in BLLs were observed in both Pella and Aggeneys. However, in Pella the proportion of children with BLLs ≥5 µg/dL dropped from 52% in 2002 to 16% in 2008. In Aggeneys, the proportion with BLLs ≥5 µg/dL decreased by only 8% and the proportion of children with BLLs ≥10 µg/dL increased by 9%, indicating ongoing lead exposure in the mining town community.

In higher-income countries, significant decreases in the risk of lead exposure in mining communities have occurred. In the USA, interventions in the Bunker Hill mining community resulted in a drop in children with BLLs ≥10 µg/dL from 48% in 1988 to 3% in 2001.[8] Programmes such as environmental decontamination, including soil treatment, appropriate worker and domestic hygiene measures, and community education and support, as well as continued screening of children's BLLs, have resulted in a significant reduction in exposure in this site. However, similar measures have seldom been implemented to the same extent in poorer countries. This series of surveys, conducted over a period of 17 years in an SA lead-mining town, indicates an elevated and enduring (73% of children had BLLs ≥5 µg/dL), yet avoidable, risk of exposure to lead.

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Table 1. Blood lead distribution by town

	Aggeneys			Pella		
	1991[6]	2002[7]	2008	1991[6]	2002[7]	2008
Participants, *n*	49	21	30	36	55	53
Sociodemographic profile						
Age (years), mean	8	7	6	8	7	6
Income <ZAR1 000 per household, %		0	7		46	66
Lead exposure (BLL) (µg/dL)						
Mean (SD)	15.9 (3.68)	7.76 (2.88)	7.37 (3.3)	13.2 (3.52)	5.73 (2.57)	4.57 (2.10)
Median	-	7.9	6.6	-	5.1	4.1
Range	9 - 27.5	2.8 - 13.4	2.4 - 15	6 - 22.0	2.5 - 17.1	2.2 - 15.1
<5, *n* (%)	-	4 (19.0)	8 (26.7)	-	26 (47.3)	37 (69.8)
≥5 - 9.9, *n* (%)	-	14 (66.7)	15 (50.0)	-	24 (43.6)	14 (26.4)
≥10, *n* (%)	-	3 (14.3)	7 (23.3)	-	5 (9.1)	2 (3.8)

SD = standard deviation; - = data not available.