

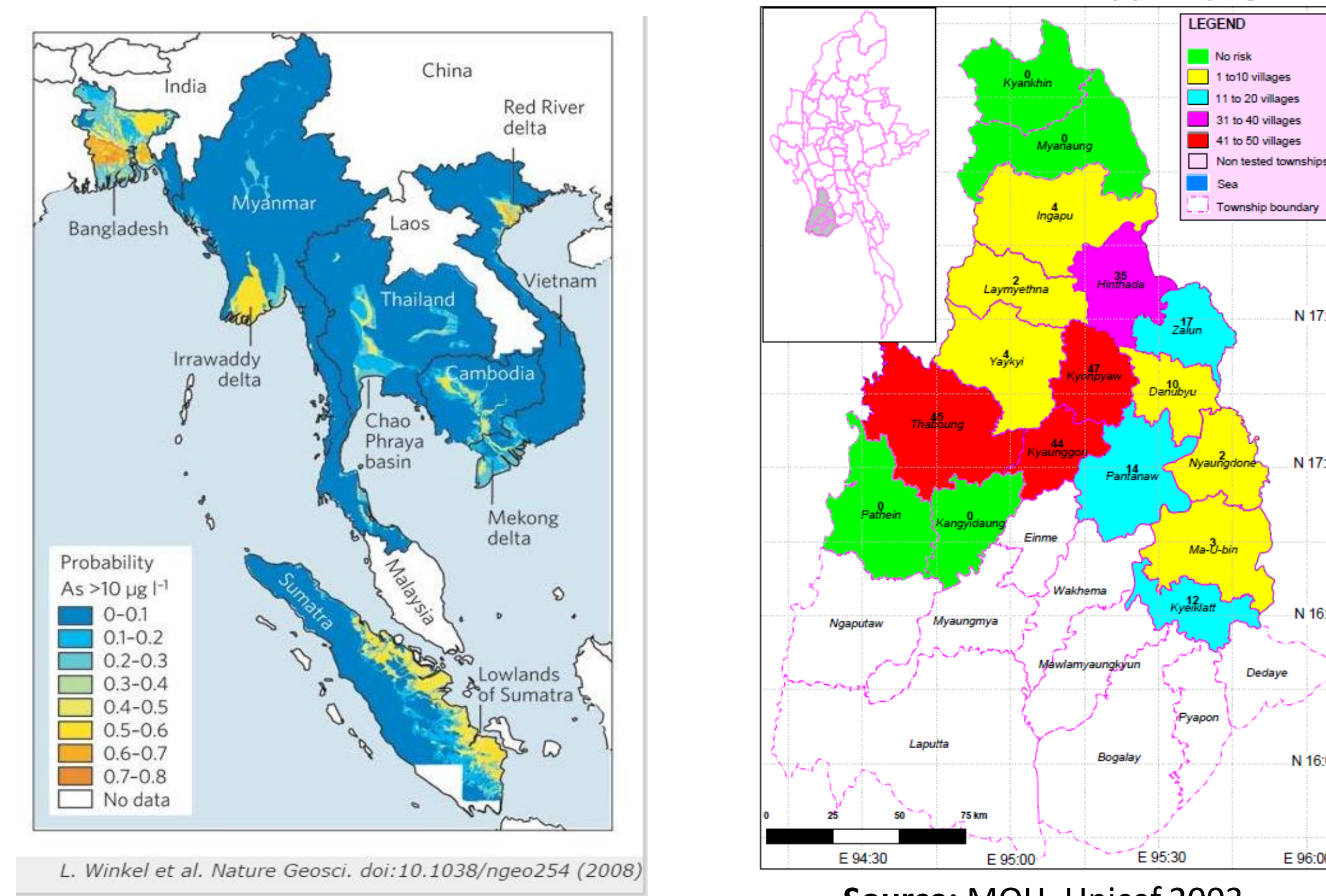
Prenatal Heavy Metals Exposure and Adverse Birth Outcomes in Myanmar: A Birth-Cohort Study

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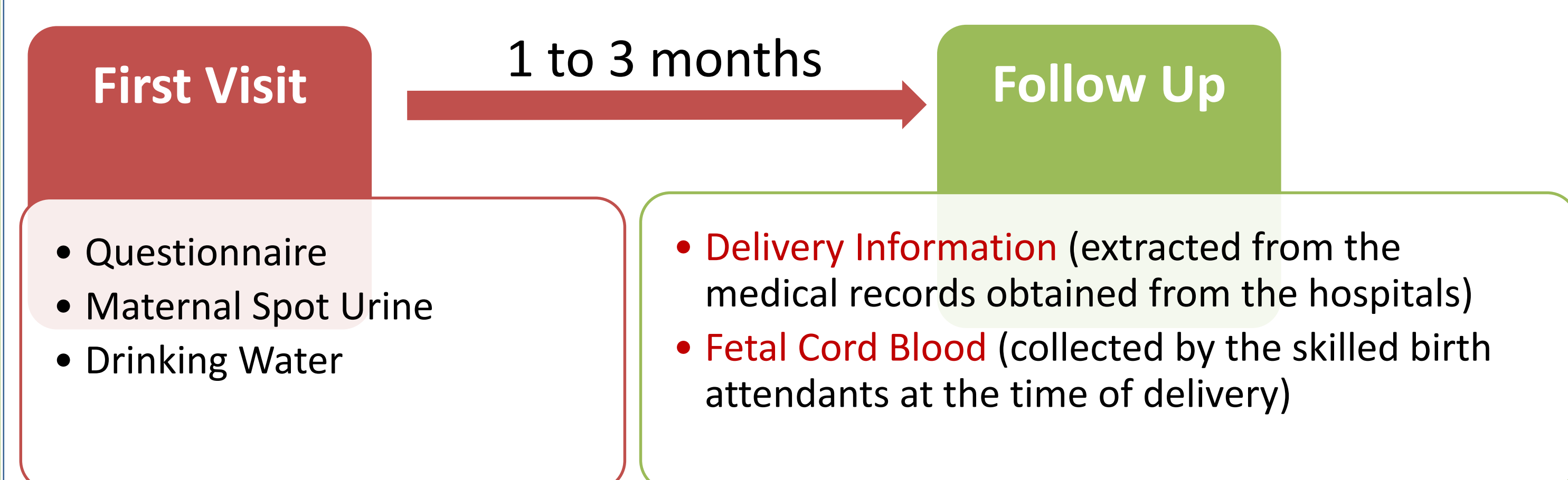
Introduction

Arsenic, cadmium and lead are well-known environmental contaminants and their toxicity at low concentration is the target of scientific concern. They could also extend the health risks from mothers to the developing fetus through trans-placental circulation. Increasing evidence have identified the associations between prenatal heavy metals exposure and adverse birth outcomes. Previously, arsenic contamination had been reported in Myanmar; however, the extent of prenatal toxicity has not been identified. In addition, no study has been explored the possible contamination of other metals. In this study, we aimed at identifying the potential effects of prenatal heavy metals exposure on the birth outcomes among Myanmar population.



Methods

This study is a part of a birth-cohort study conducted with 419 pregnant women in Ayeyarwady Division, Myanmar started in 2016.



Exposure Assessment

Heavy metals concentration by ICP-MS

DL was calculated as 3SD of procedural blanks.

Quality assurance by Certified Reference Materials (NIST 1643f, NIES No.18 Human Urine, Seronum)

Adjusted for creatinine by Jaffe colorimetric method

Maternal Health, Birth Outcomes & Covariates

- Questionnaires (Face to face interview)

- Medical records

We examined the extent of environmental exposure of those metals during pregnancy and their associations with the birth outcomes at the time of delivery using multivariable logistic regression analysis after adjusting maternal age, maternal education, smoking status, baby's sex, antenatal visit and mode of delivery as cofounders.

Results

Table 1. Heavy Metals Concentration in Maternal Urine (n = 419)

Adjusted Urinary Heavy Metals Concentration (µg/g creatinine)	Median	IQR
Arsenic	74	(45 – 127)
Cadmium	0.86	(0.50 – 1.40)
Selenium	23	(18 – 30)
Lead	1.8	(1.0 – 3.3)

Table 2. Comparison of Exposure Level on Different Birth Outcomes (n = 419)

Adjusted urinary heavy metals concentration (µg/g creatinine)	Preterm Delivery ^θ			Low Birth Weight [†]			Preterm and Low Birth Weight		
	Yes (n = 80)	No (n = 339)	p-value	Yes (n = 26)	No (n = 393)	p-value	Yes (n = 18)	No (n = 401)	p-value
Arsenic	108.1	103.3	0.719	110.6	103.8	0.759	116.4	103.7	0.626
Cadmium	1.8	1.3	0.092	3.0	1.3	0.002	3.2	1.3	0.003
Selenium	25.0	25.1	0.963	29.1	24.8	0.090	28.3	24.9	0.263
Lead	2.4	2.8	0.366	1.9	2.8	0.272	1.98	2.8	0.322

Table 3. Associations between Maternal Heavy Metals Exposure and Low Birth Weight (n = 419)

Characteristics	Crude OR (95% CI)	Adjusted OR (95% CI)
Maternal age (years)	0.99 (0.93 – 1.05)	1.04 (0.96 – 1.11)
Maternal education	0.67 (0.45 – 1.01)	0.72 (0.46 – 1.13)
Gestational age (weeks)	0.79 (0.69 – 0.90) ***	0.83 (0.72 – 0.95) **
Primigravida (ref: non primigravida)	2.16 (0.89 – 5.25) *	4.23 (1.31 – 13.65) *
Antenatal visit (ref: < 4 times)	0.54 (0.24 – 1.20)	0.55 (0.22 – 1.36)
Mode of delivery (ref: normal vaginal delivery)	0.68 (0.31 – 1.51)	0.67 (0.28 – 1.63)
Baby's Sex (ref: male)	1.58 (0.71 – 3.50)	1.60 (0.67 – 3.85)
Smoking status (ref: no exposure)	1.01 (0.42 – 2.22)	0.76 (0.32 – 1.82)
Urinary As concentration (µg/g creatinine)	1.00 (0.99 – 1.00)	0.99 (0.99 – 1.00)
Urinary Cd concentration (µg/g creatinine)	1.01 (1.02 – 1.19) *	1.10 (1.01 – 1.21) *
Urinary Se concentration (µg/g creatinine)	1.02 (0.99 – 1.04)	1.02 (0.99 – 1.06)
Urinary Pb concentration (µg/g creatinine)	0.85 (0.67 – 1.08)	0.76 (0.57 – 1.03)

*p < 0.05, ** p < 0.01, ***p < 0.001

Conclusions

This is the first study to reveal the extent of prenatal heavy metals exposure in Myanmar. The present study identified that Myanmar mothers were highly exposed to cadmium which should be counted as a public health threat in Myanmar. Prenatal maternal cadmium exposure was associated with an occurrence of low birth weight.

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