

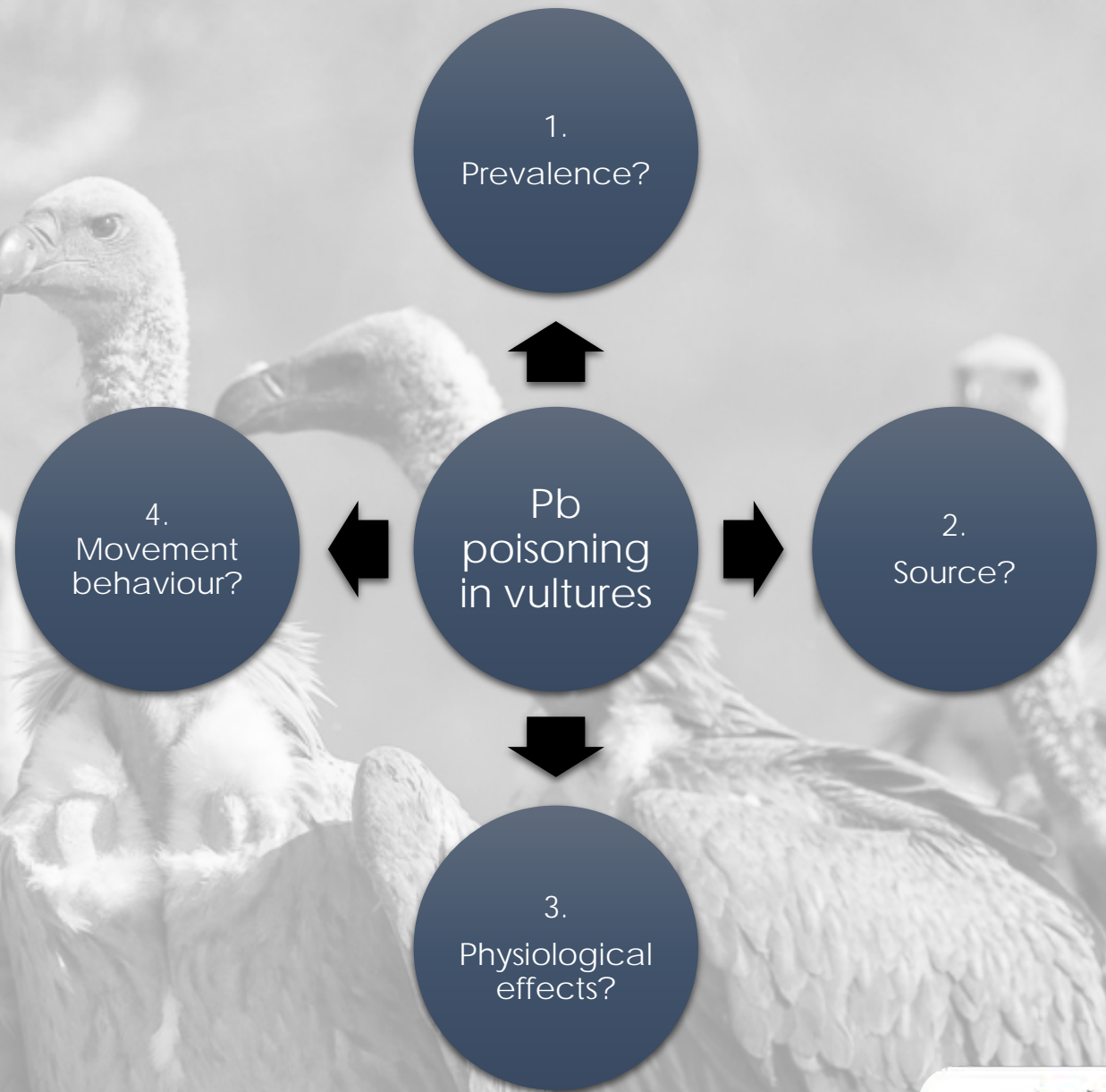
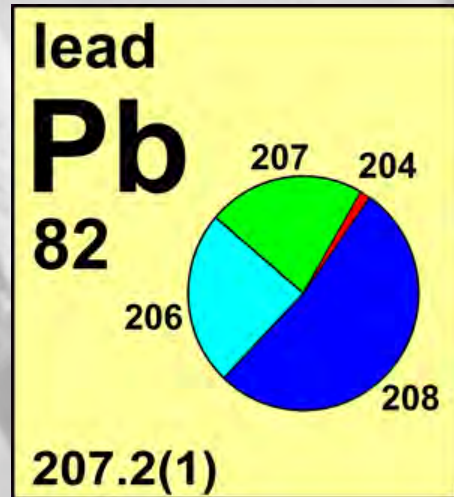
# Lead poisoning in South Africa's Cape and White-backed Vultures

**Dr Linda van den Heever**

Species Conservation Programme Manager  
BirdLife South Africa

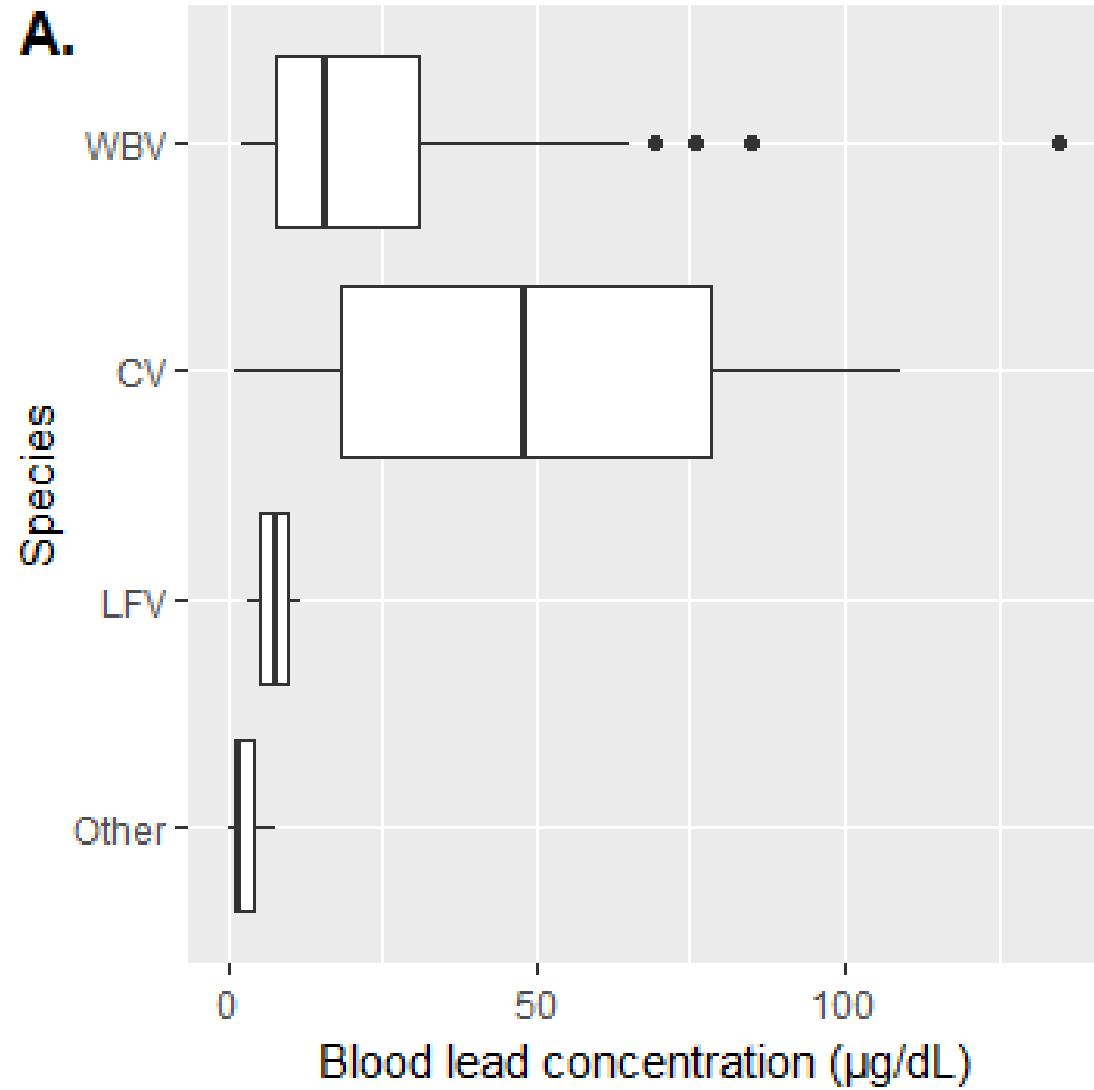


UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA



# Lead Project

# Blood



Van den Heever et al. 2019



www.wildlife-photography.com  
Chris Van Heever

**Possible sources**

**Anthropogenic**

**Environmental**

**Uranium, lead,  
coal, incl.  
processes**

**Mining**

**Soil/dust**

**Petrochemical**

**Industry**

**Air**

**Fuel**

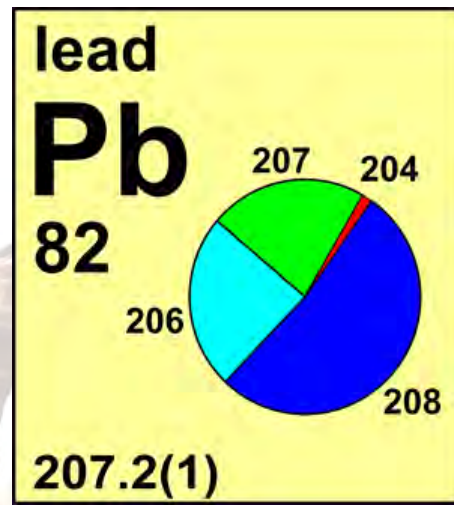
**Legacy**

**Water**

**Ammunition**

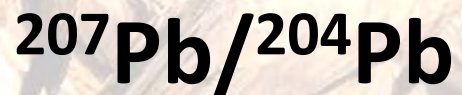
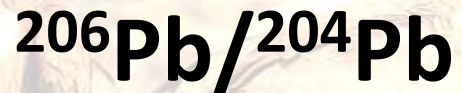
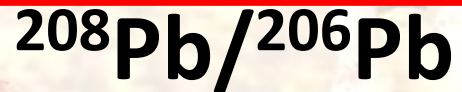
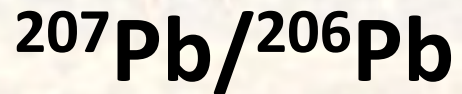


# Research questions

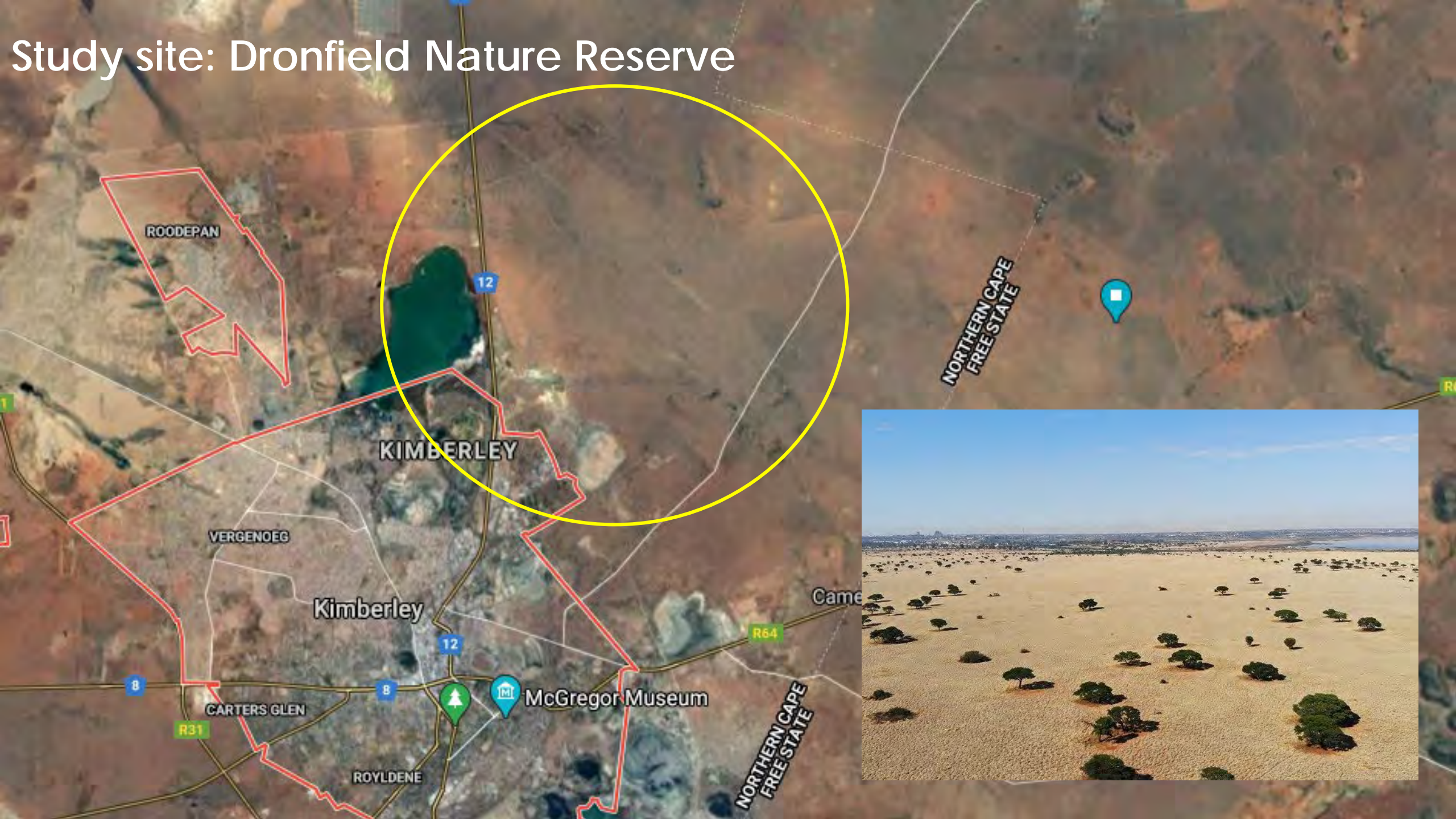


## Lead isotope analysis:

- What are the ratios of Pb isotopes in the different sources?
- Do they explain the Pb isotope ratios found in vulture blood?



# Study site: Dronfield Nature Reserve



UNIVERSITY OF THE  
WITWATERSRAND,  
JOHANNESBURG



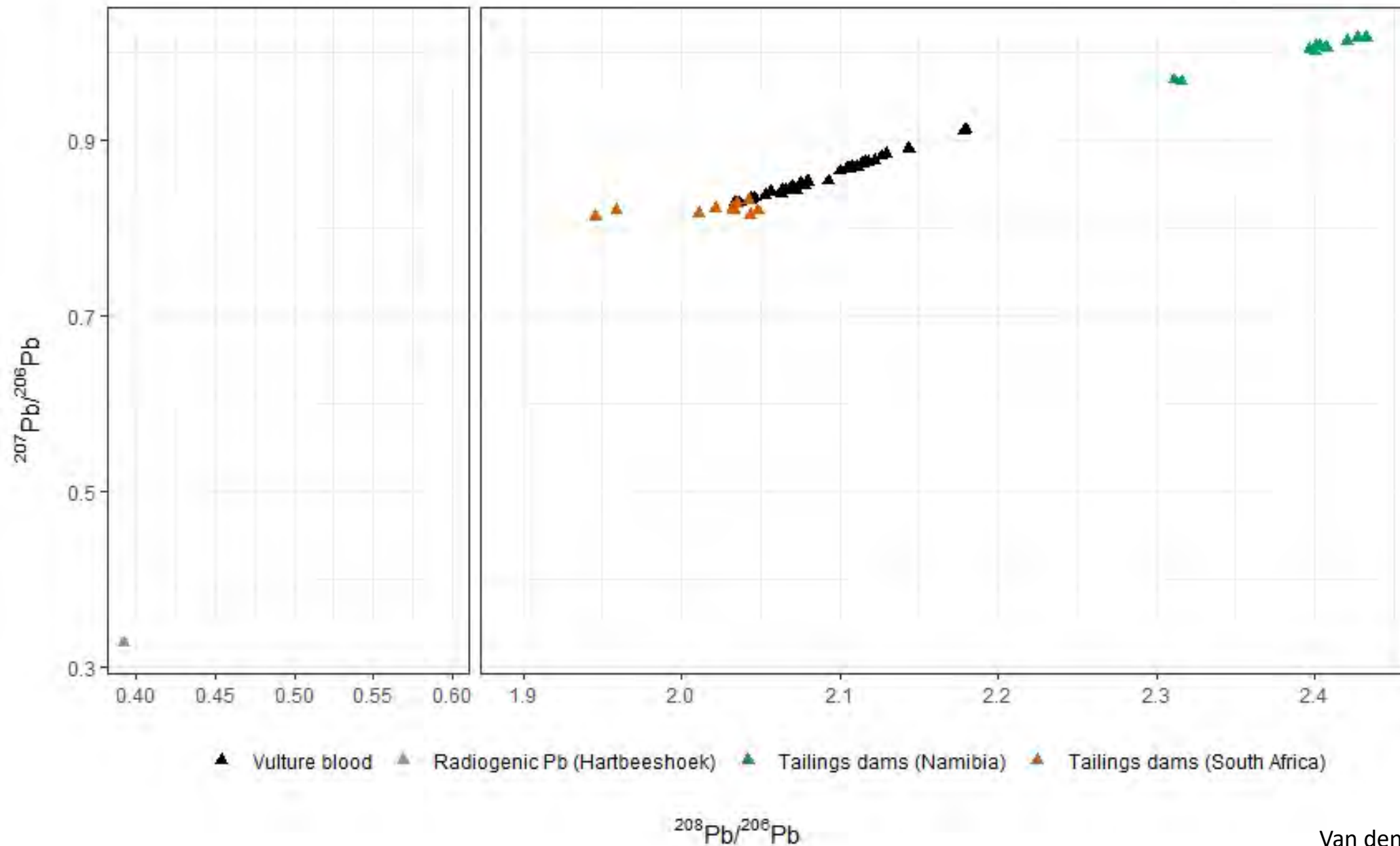
Lead extraction





MC-ICP-MS

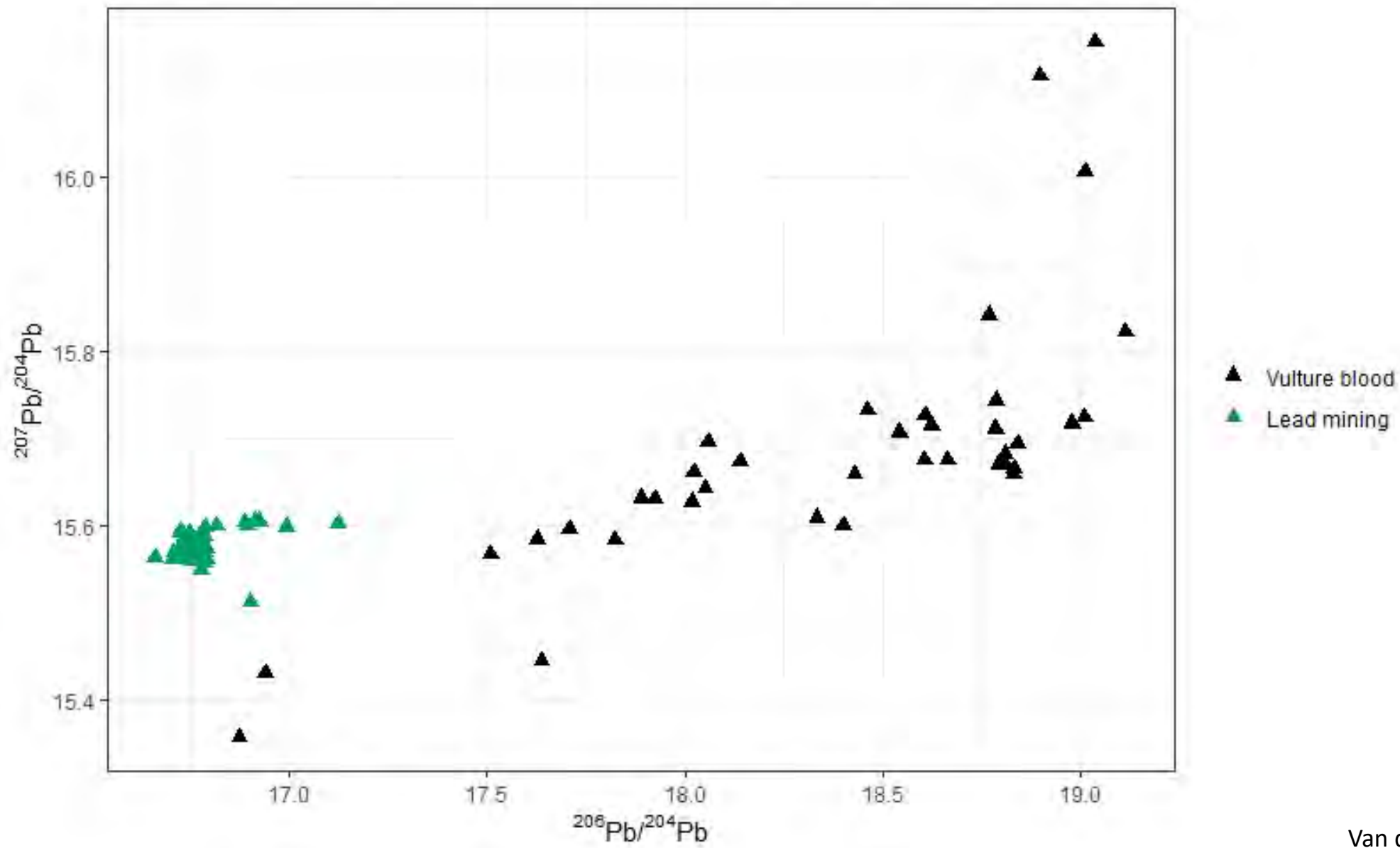




# Uranium

Van den Heever et al. 2022

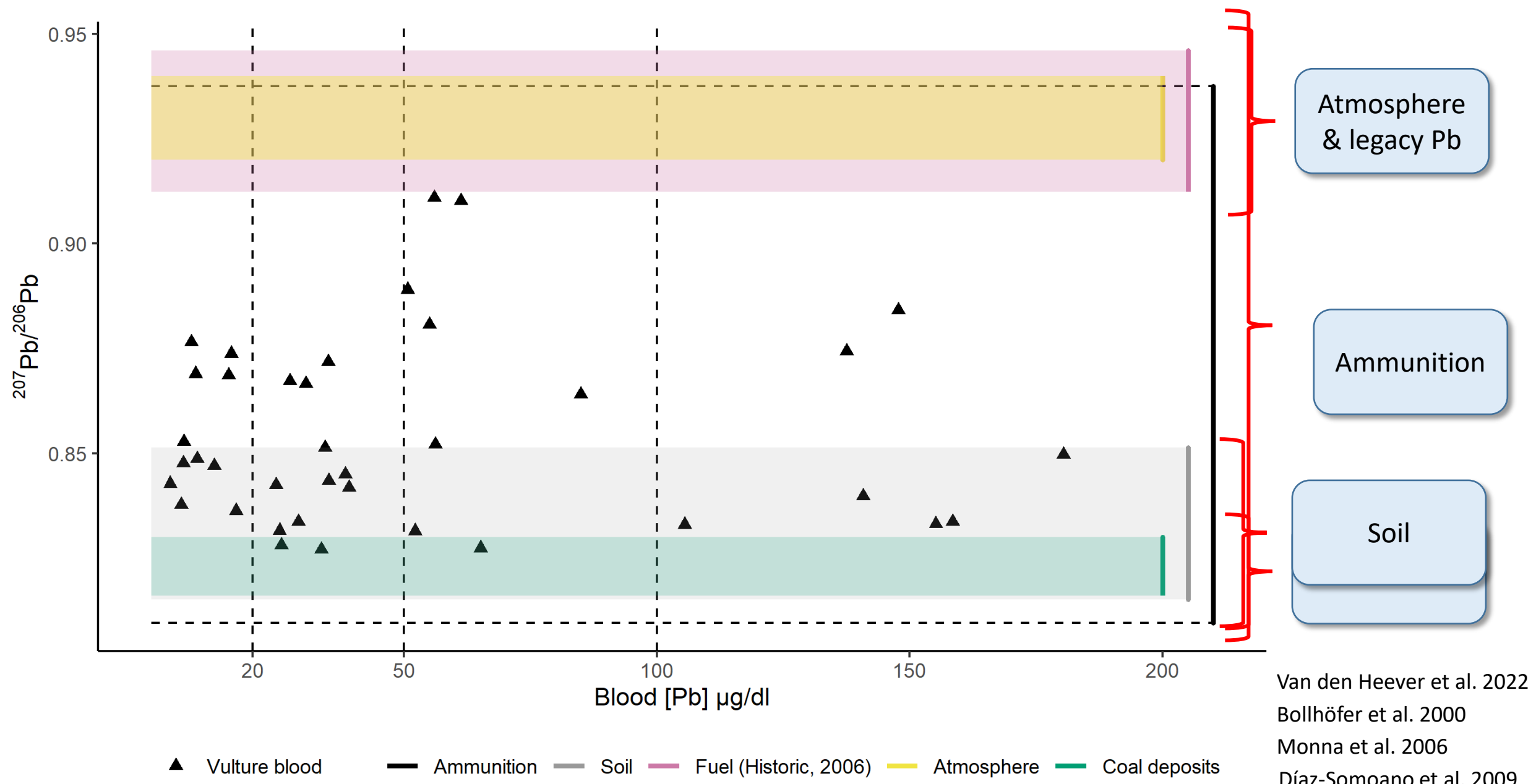
Kupi et al. 2020



**Lead mining**

Van den Heever et al. 2022

Reid et al. 1997



Atmosphere & legacy Pb

Ammunition

Soil

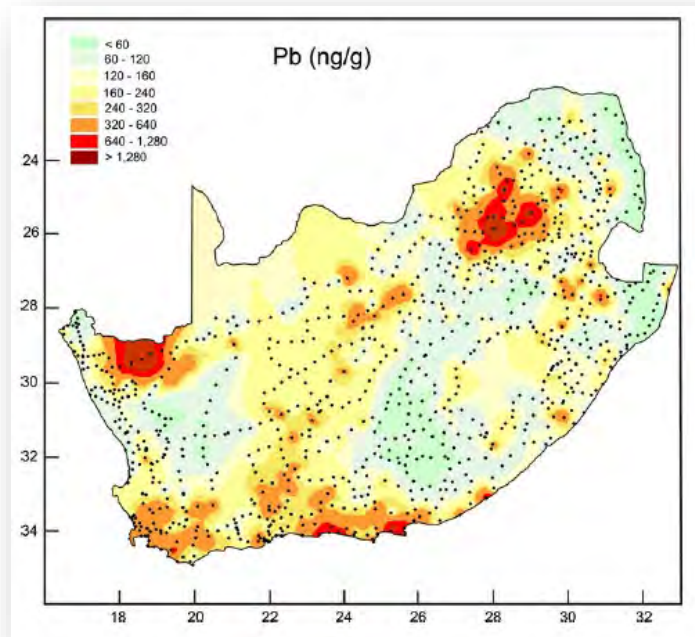
Van den Heever et al. 2022  
 Bollhöfer et al. 2000  
 Monna et al. 2006  
 Díaz-Somoano et al. 2009

▲ Vulture blood    — Ammunition    — Soil    — Fuel (Historic, 2006)    — Atmosphere    — Coal deposits

# Ammunition vs soil

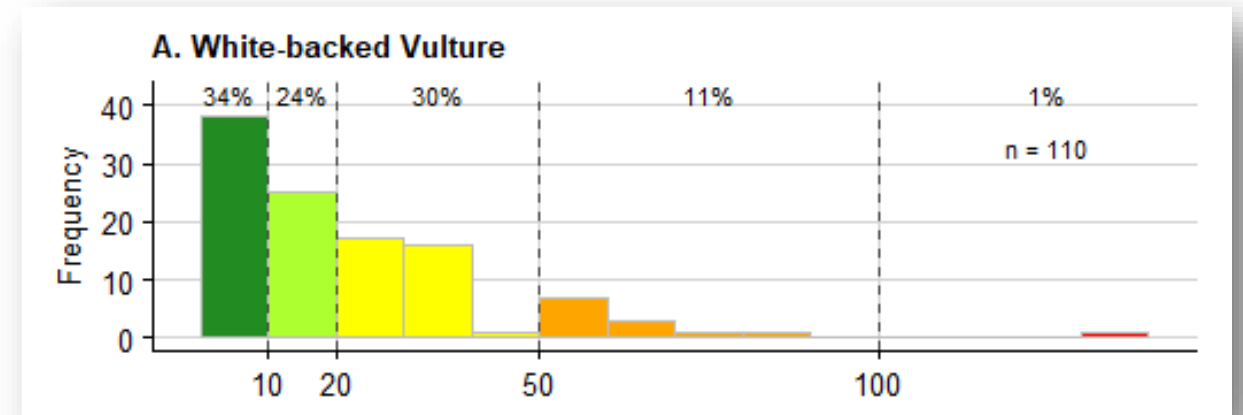
## Soil

- De Villiers et al. (2010)
  - Only 3% had extractable Pb >1 ug/g
- Soil Pb concentration in this study: 8 ug/g



## Ammunition

- Almost pure lead
- Scavenging lifestyle of vultures



Springbok shot with .308 lead-core bullet



Springbok shot with .243 lead-core bullet



**Multiple sources:**

- Gut piles
- Vulture restaurants
- Wildlife management
- Hunting/culling operations

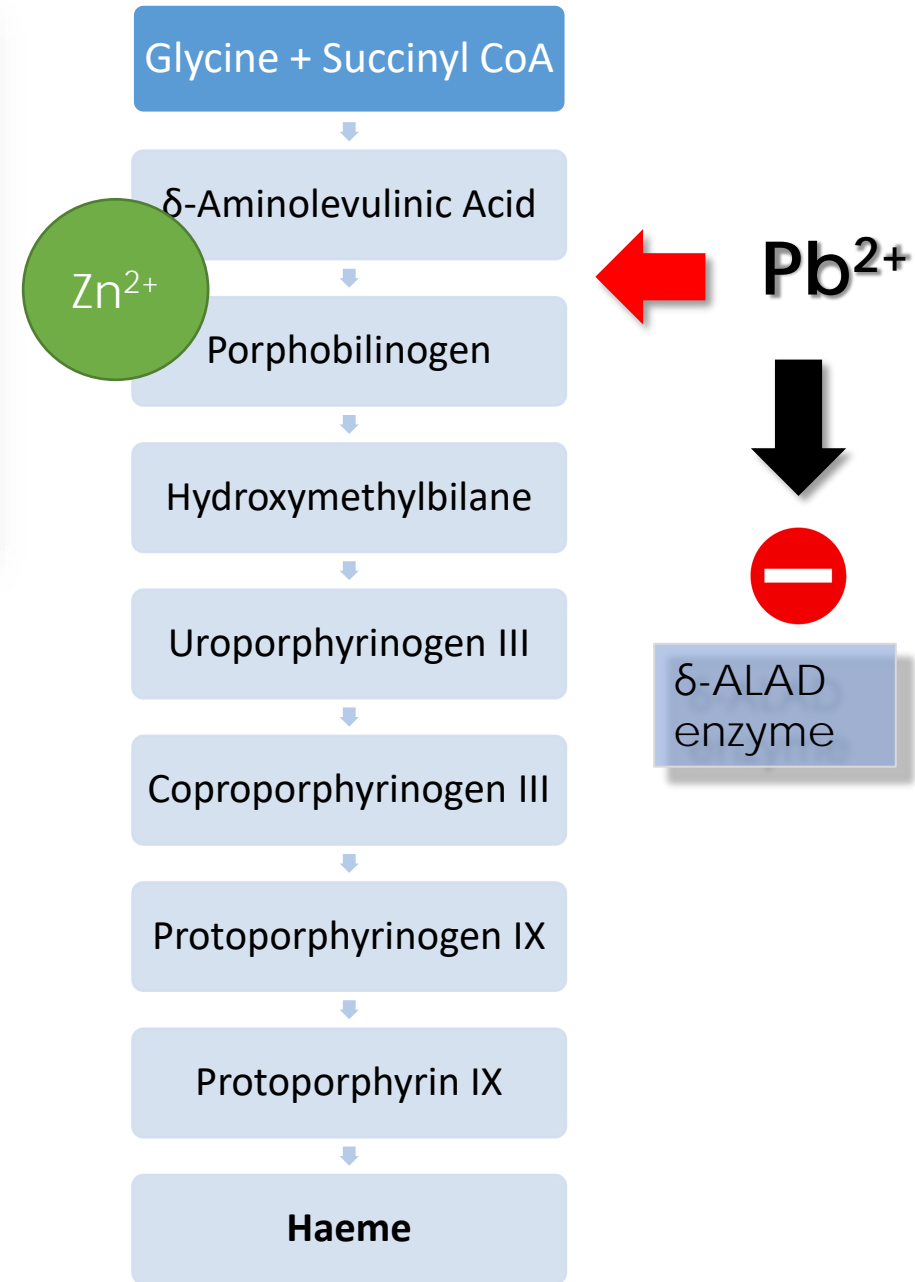
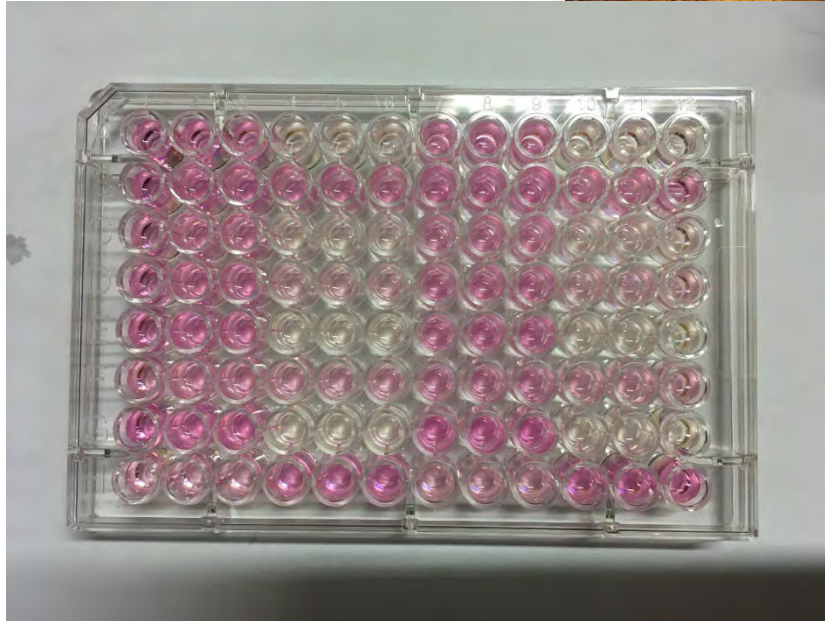
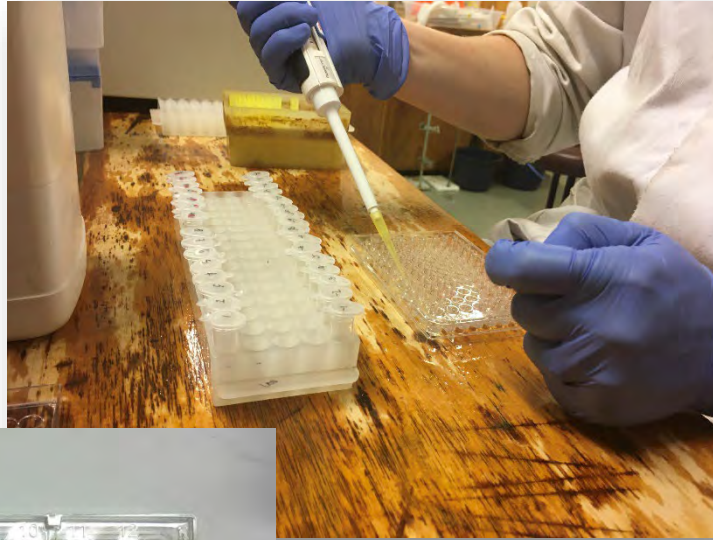
Where is the lead coming from?

# Research questions

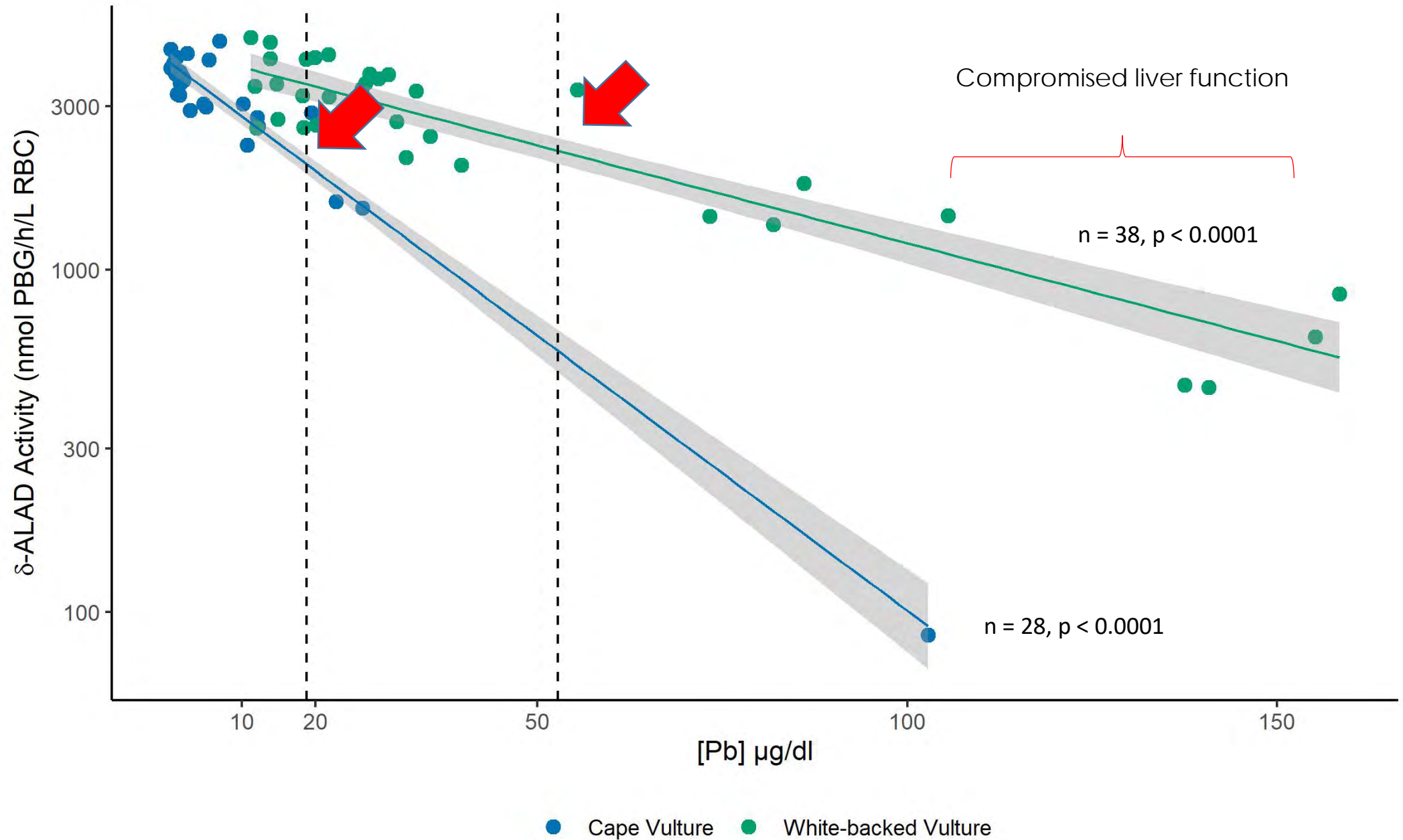
- What are the sub-lethal effects of lead in White-backed Vulture chicks?



# Haeme synthesis

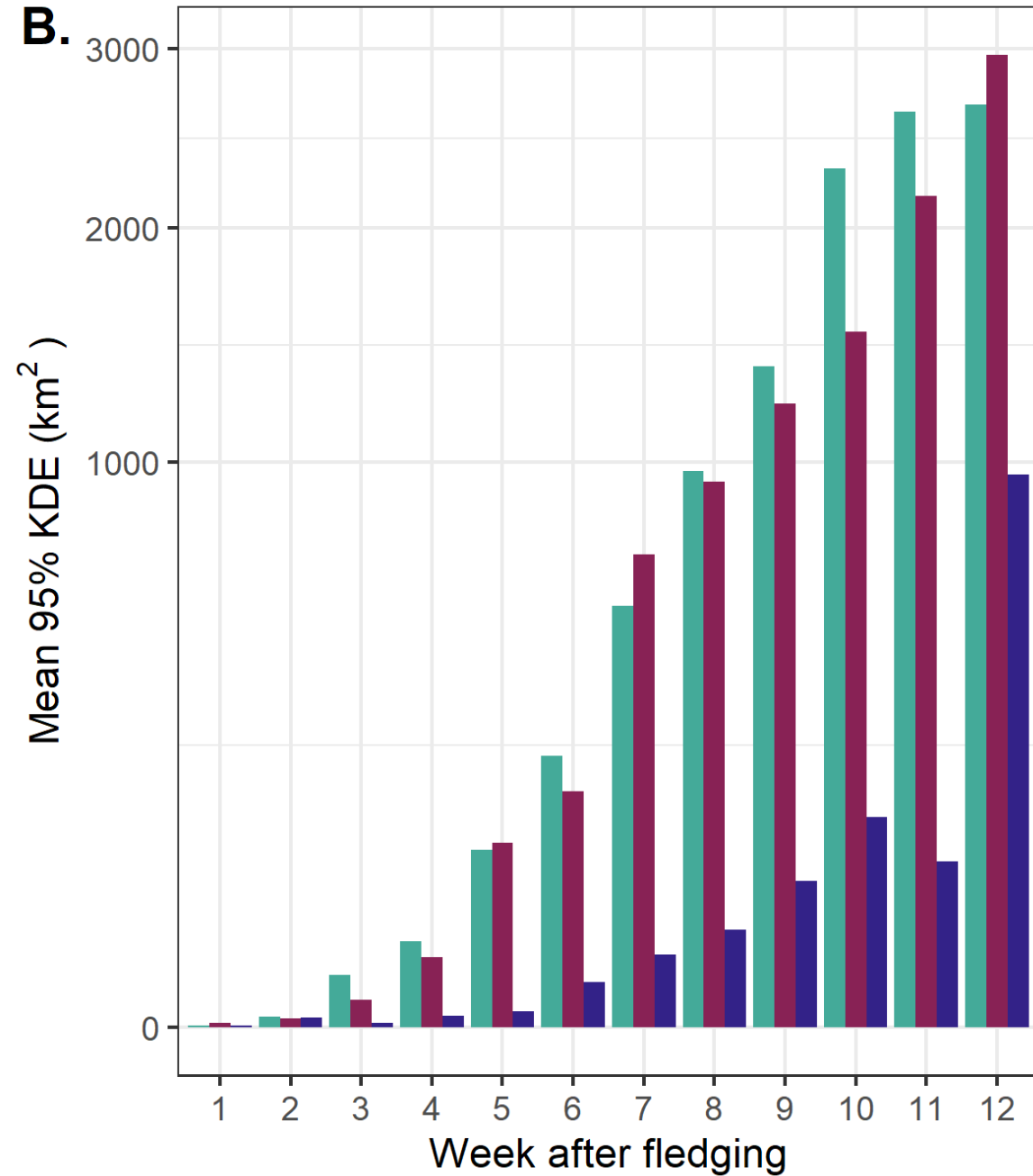
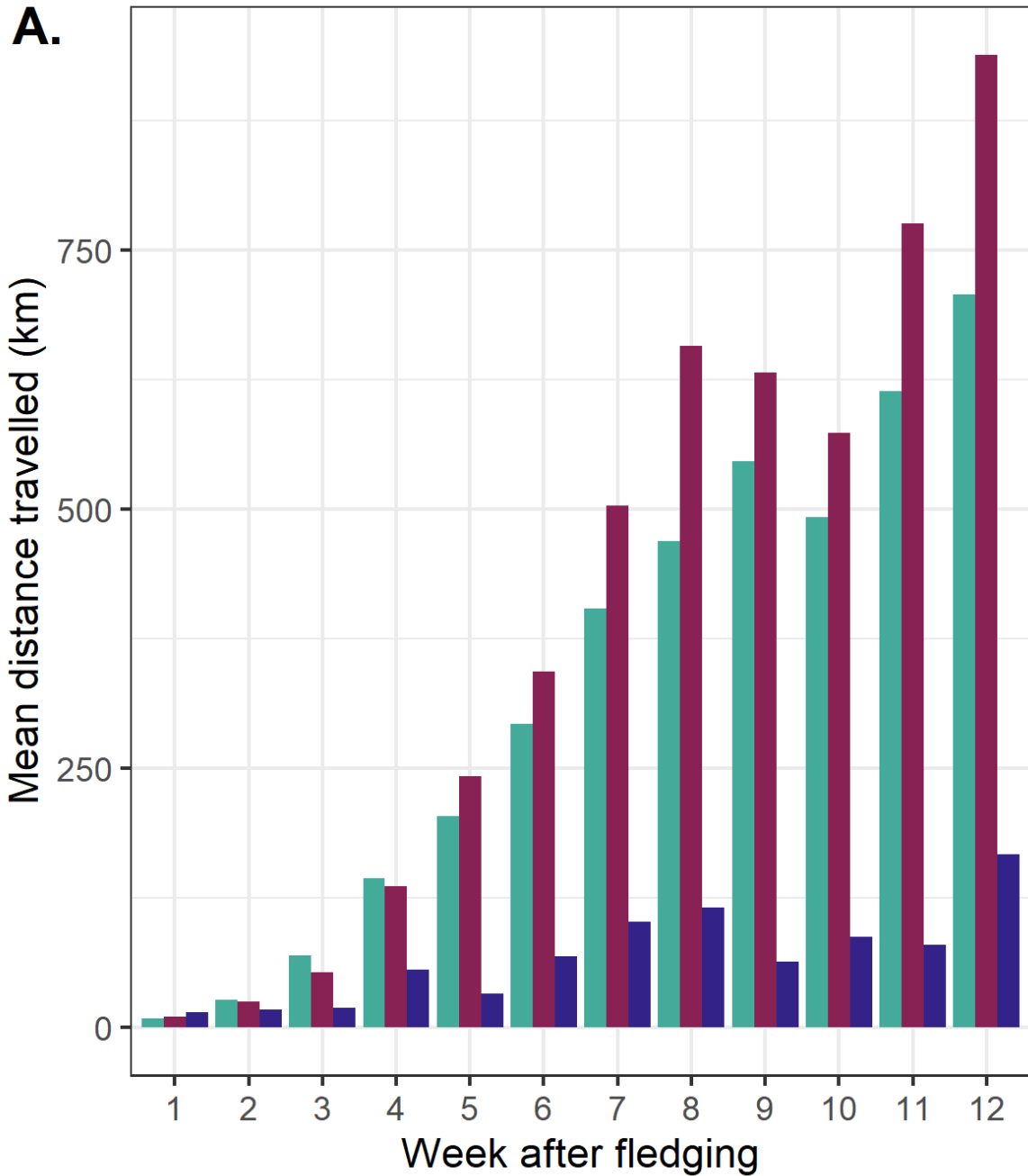


# Sub-lethal effects of Pb poisoning









Blood [Pb] (µg/dL) ■ <20 ■ 20 - 52 ■ >52

Norman 26 ug/dL



Kevin 40 ug/dL



Elsie 83 ug/dL





# Summary

- Lead poisoning is **widely prevalent** – chicks and adults
- **Lead ammunition** fragments embedded in carrion
- Chicks suffer from **anaemia** and **liver damage**
- Chicks fledging with **compromised health**



# Implications for consumers

- **No maximum limits** for Pb in game meat in SA
- **Monitoring for toxic metals** in game meat is not mandatory
- **Game meat inspectors** focus on diseases
- All game meat sampled **failed EU product limit** for Pb (Nkosi et al. 2022)
- Offal and blood meat are frequently given to **farm workers**

Game meat may be marketed as leaner and healthier, but it is **NOT** harmless

# Next steps

- New Vulture Conservation Officer:
  - Comprehensive review of lead-free alternatives
  - Testing and development
  - Engagement with game reserves, hunters and culling operators
- Game meat harvesting protocol – Greater Kruger area
- Research
  - Testing Pb levels in venison



# Thank you



*Photo credits:*  
Marietjie Froneman  
Albert Froneman  
Chris van Rooyen  
Mark Anderson