

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

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60% of vulture mortalities are attributable to poisoning

Intentional

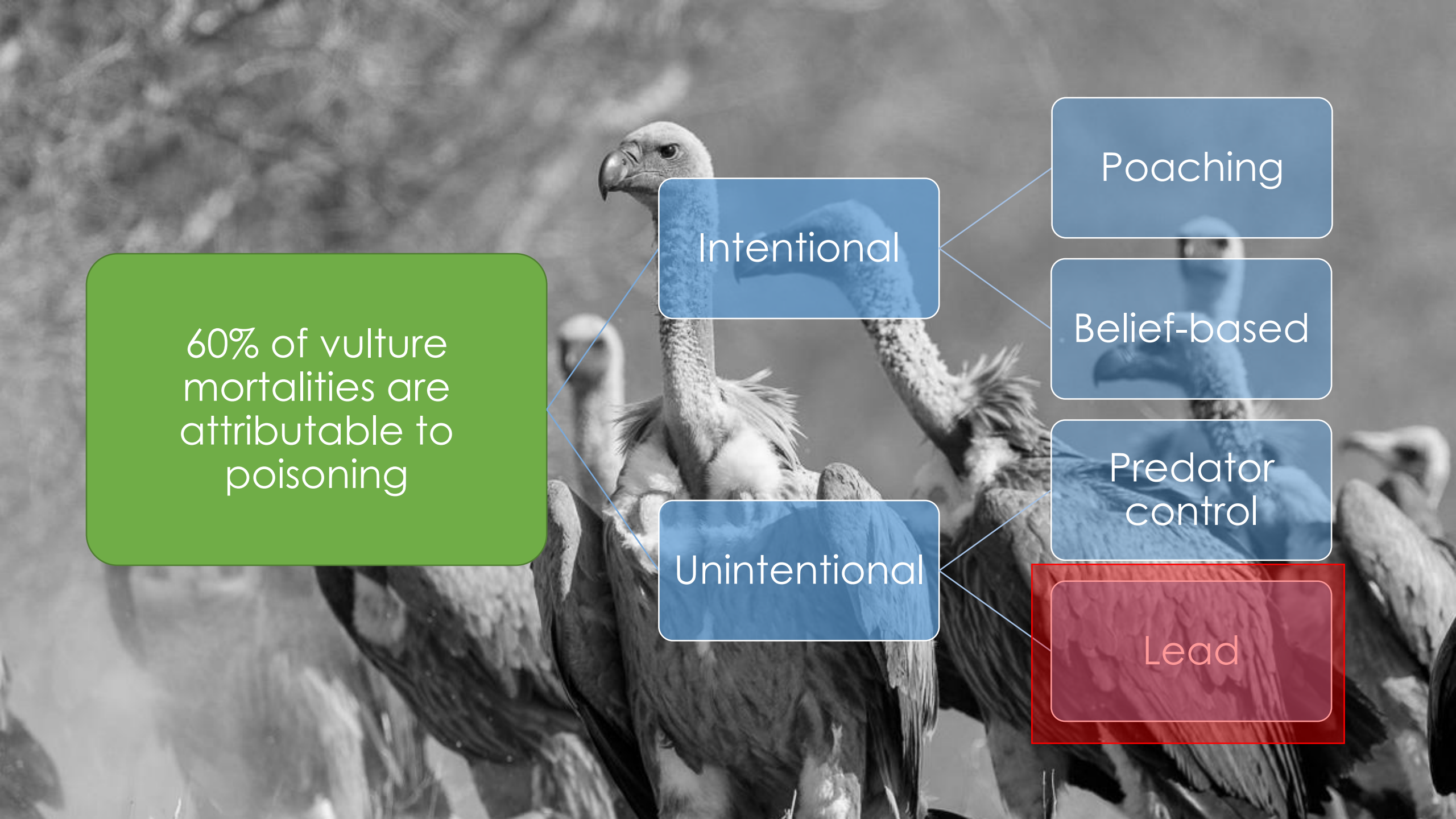
Poaching

Belief-based

Predator control

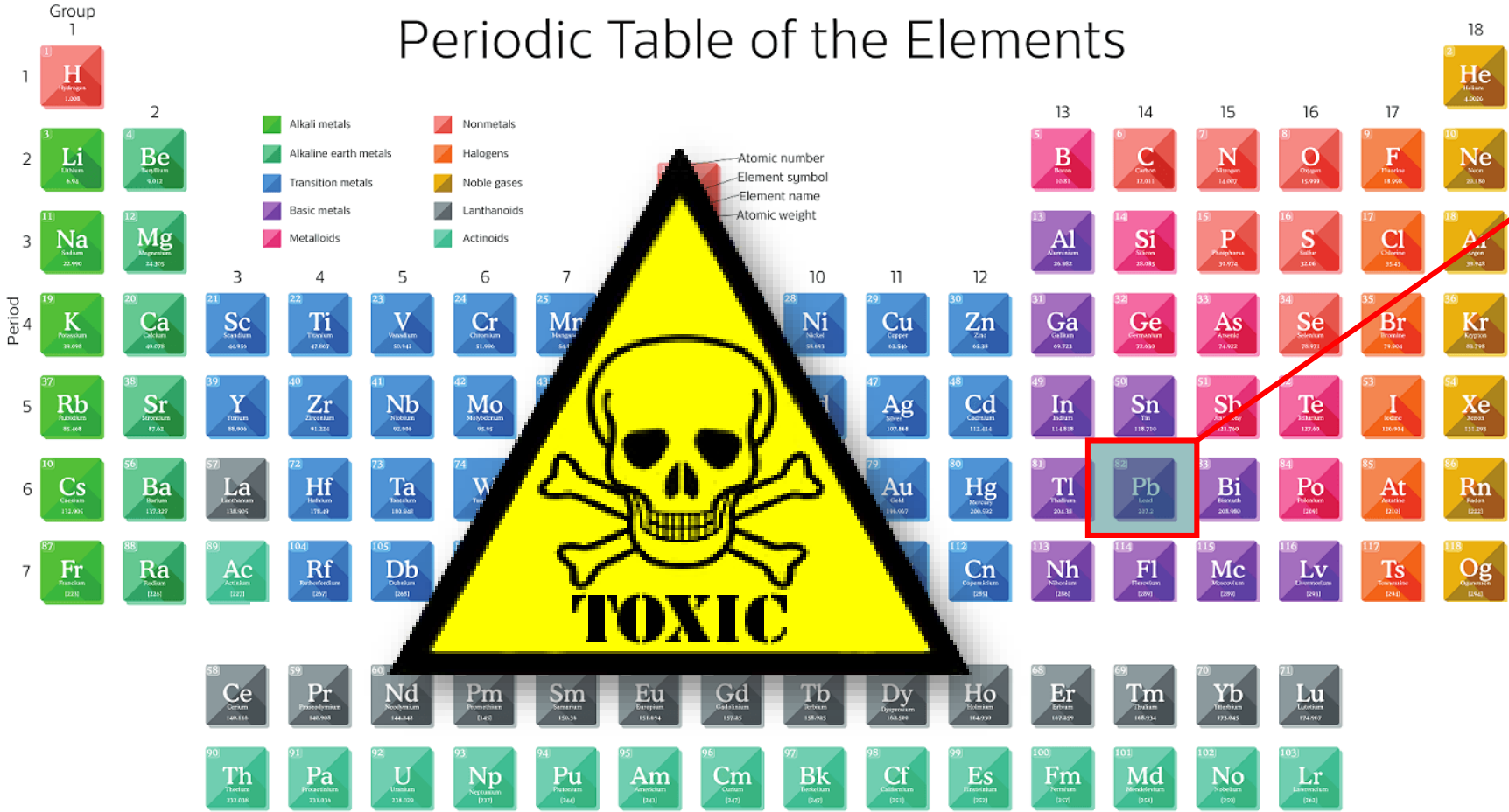
Unintentional

Lead



Lead – the basics

Periodic Table of the Elements



82

Pb

Lead

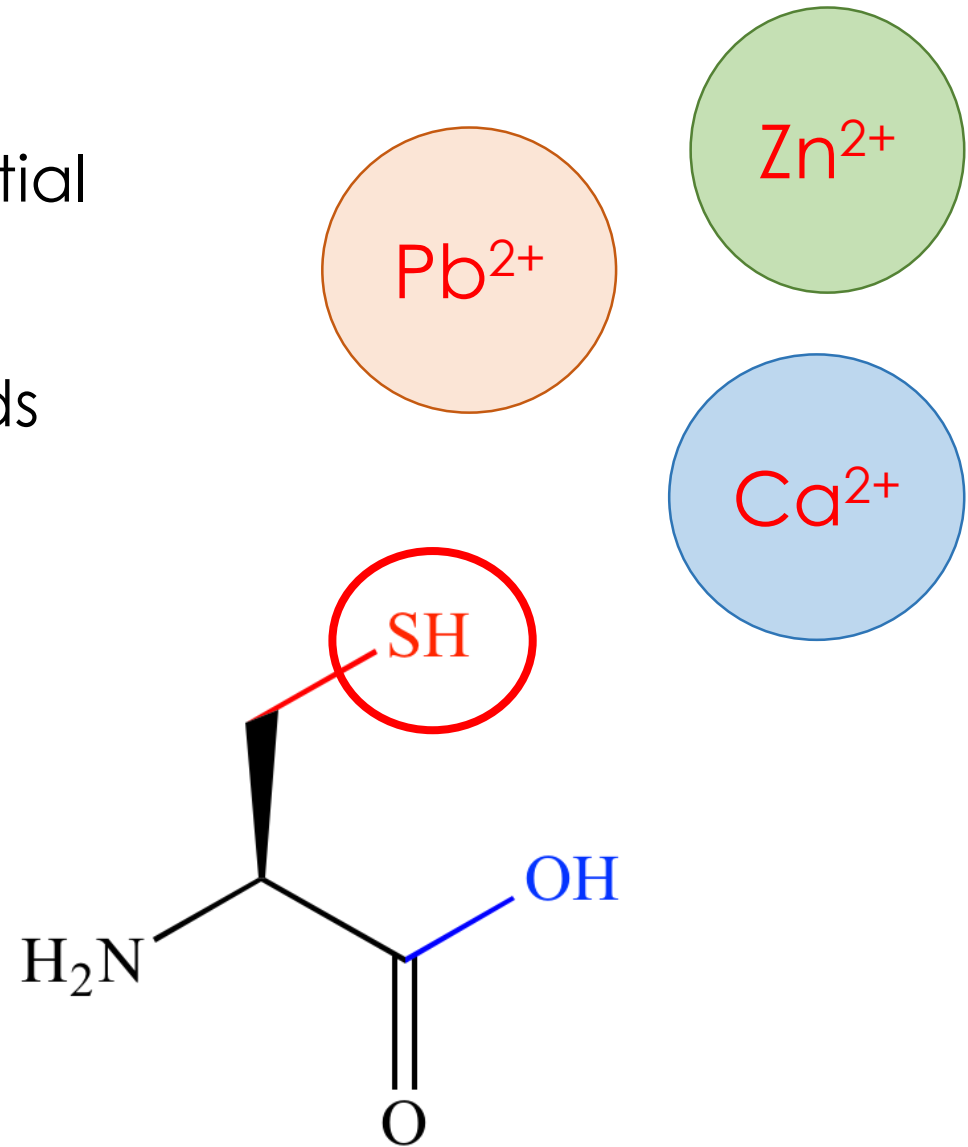
207.2

- Heavy metal
- Dense
- Malleable
- Low melting point
- Corrosion resistant

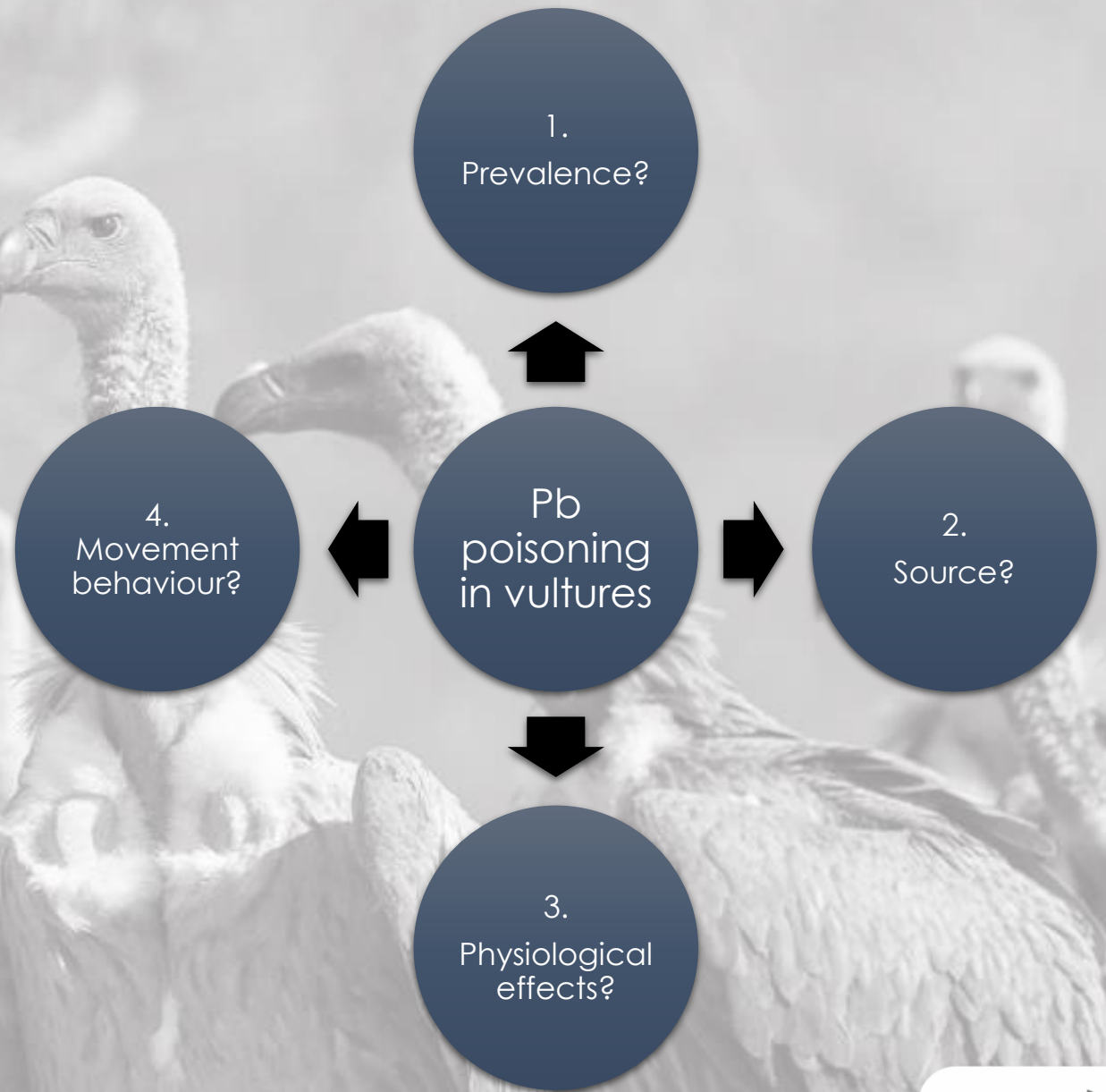
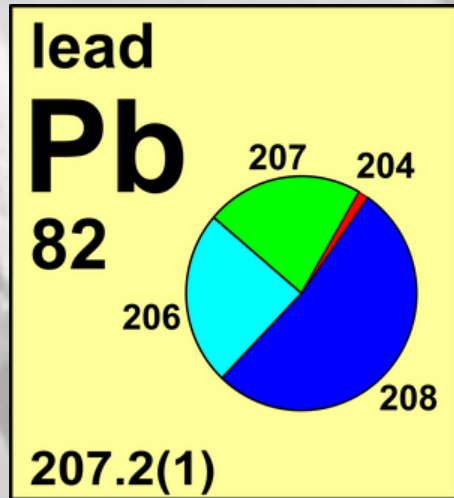


Modern uses of lead

- Inhibits/mimics calcium and other essential metals such as zinc
- Strong affinity for sulfhydryl groups – holds amino acids together
- Can cross the blood-brain barrier
- Effects every organ system in the body
- Children particularly vulnerable

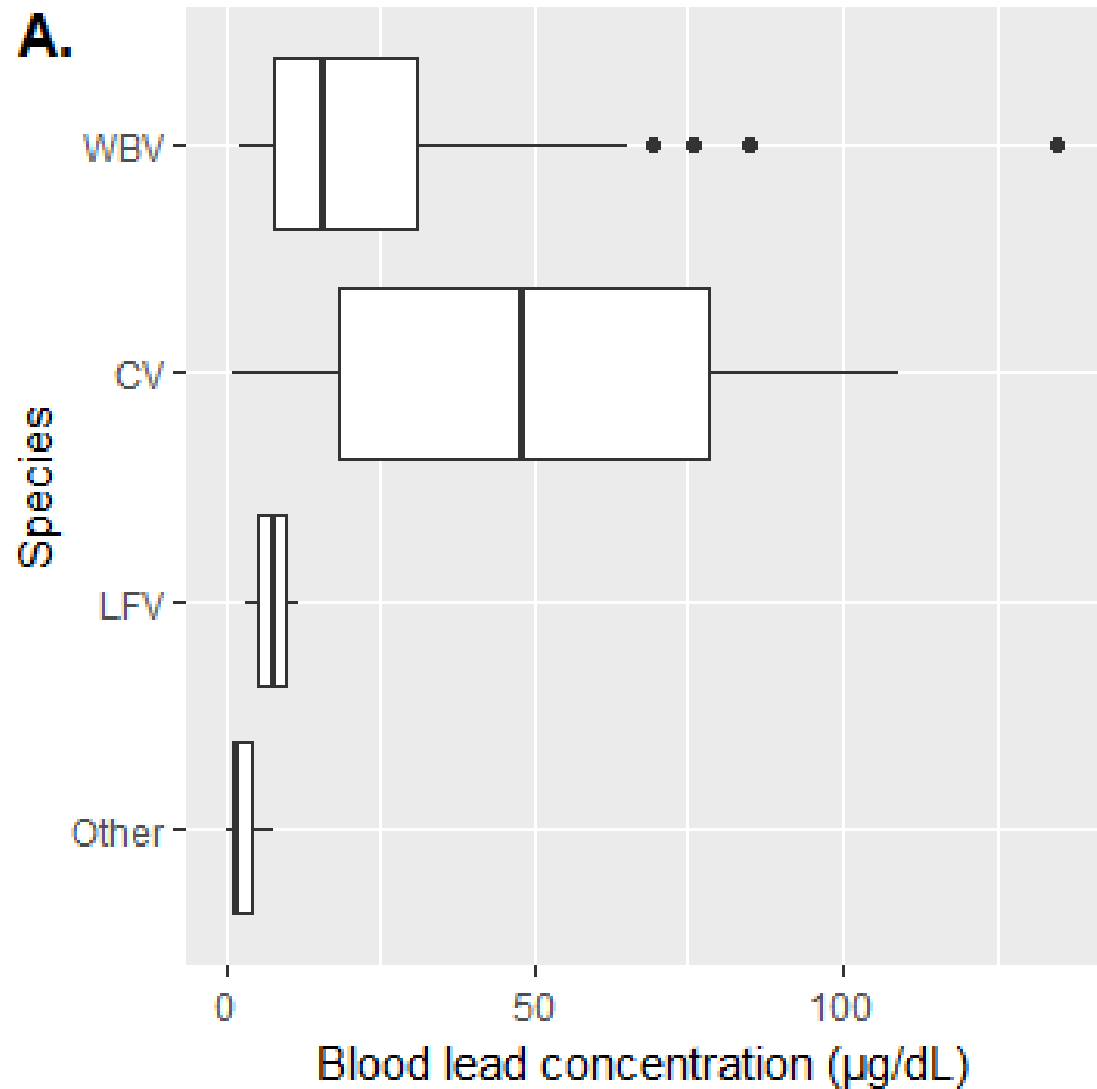


The problem with lead



Lead Project

Blood



Van den Heever et al. 2019



www.wildlifephotography.co.za
Chris van Rooyen

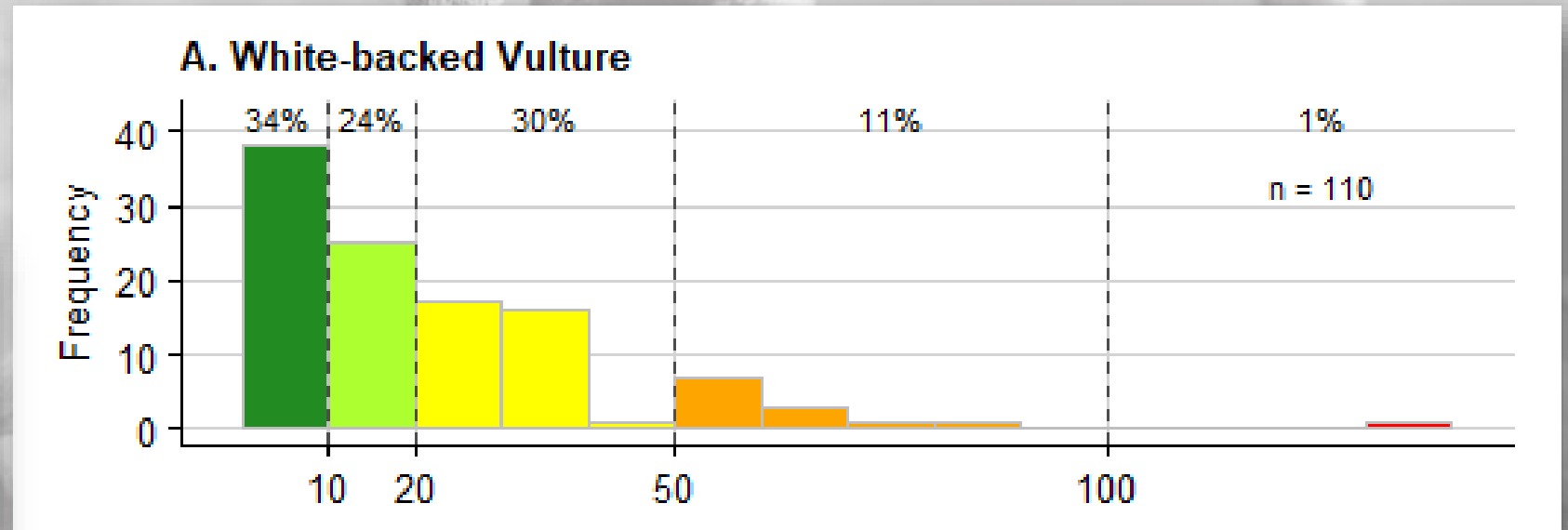
Where is the lead coming from?

1. Scavenging lifestyle



- Non-scavenging birds only exposed to environmental lead

2. Lead poisoning in chicks



Lead ammunition

Possible sources

Anthropogenic

Environmental

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

Mining

Soil/dust

Petrochemical

Industry

Air

Fuel

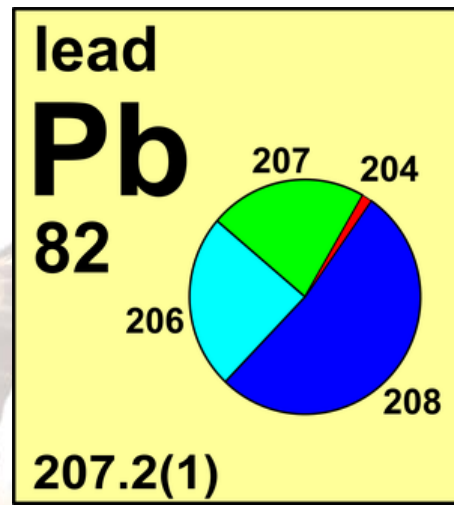
Legacy

Water

Ammunition

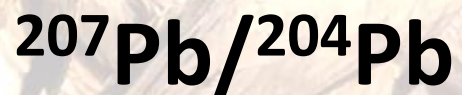
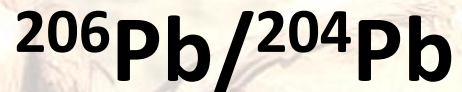
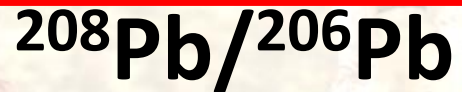
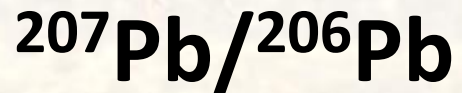


Research questions

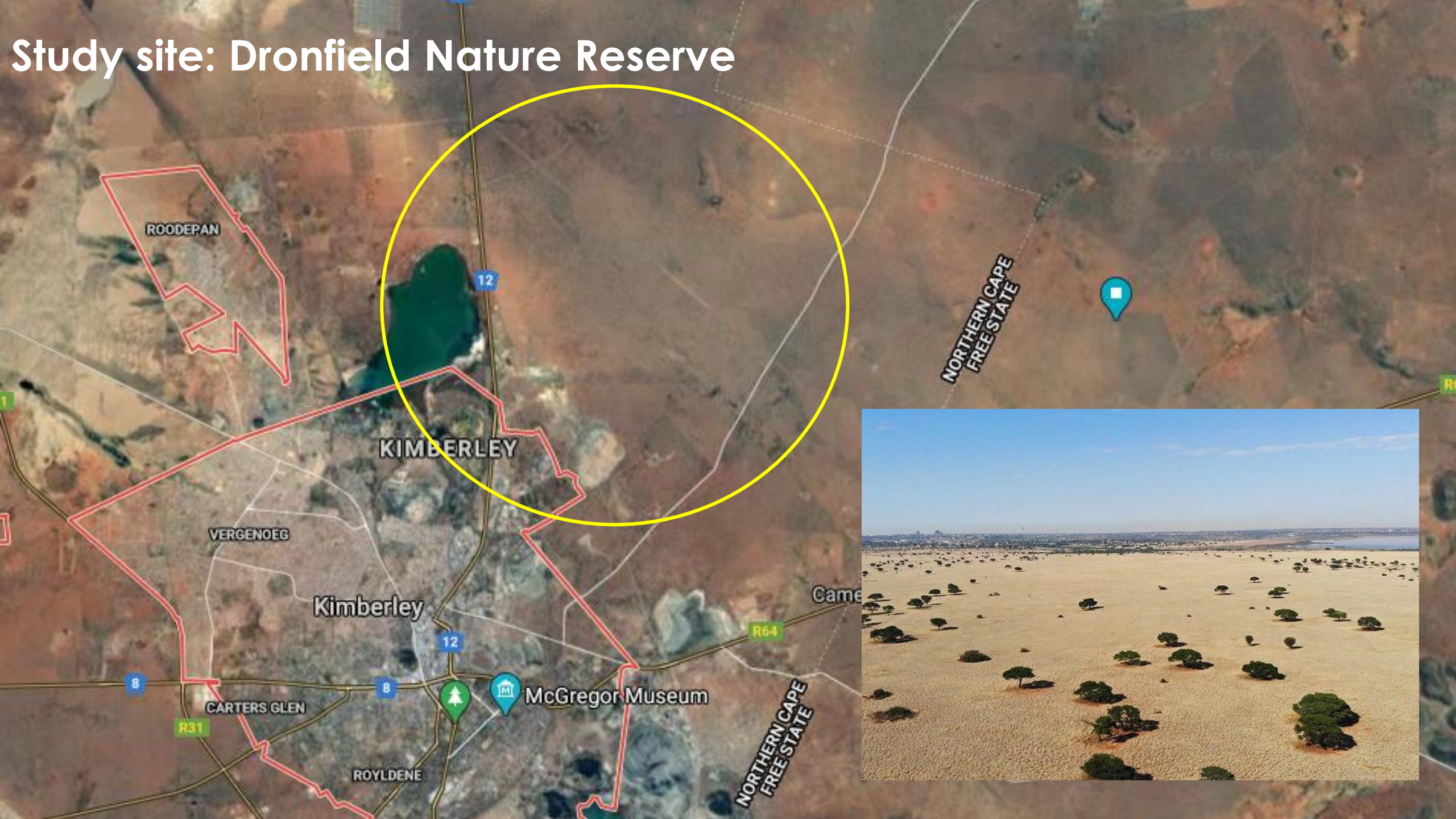


Lead isotope analysis:

- 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



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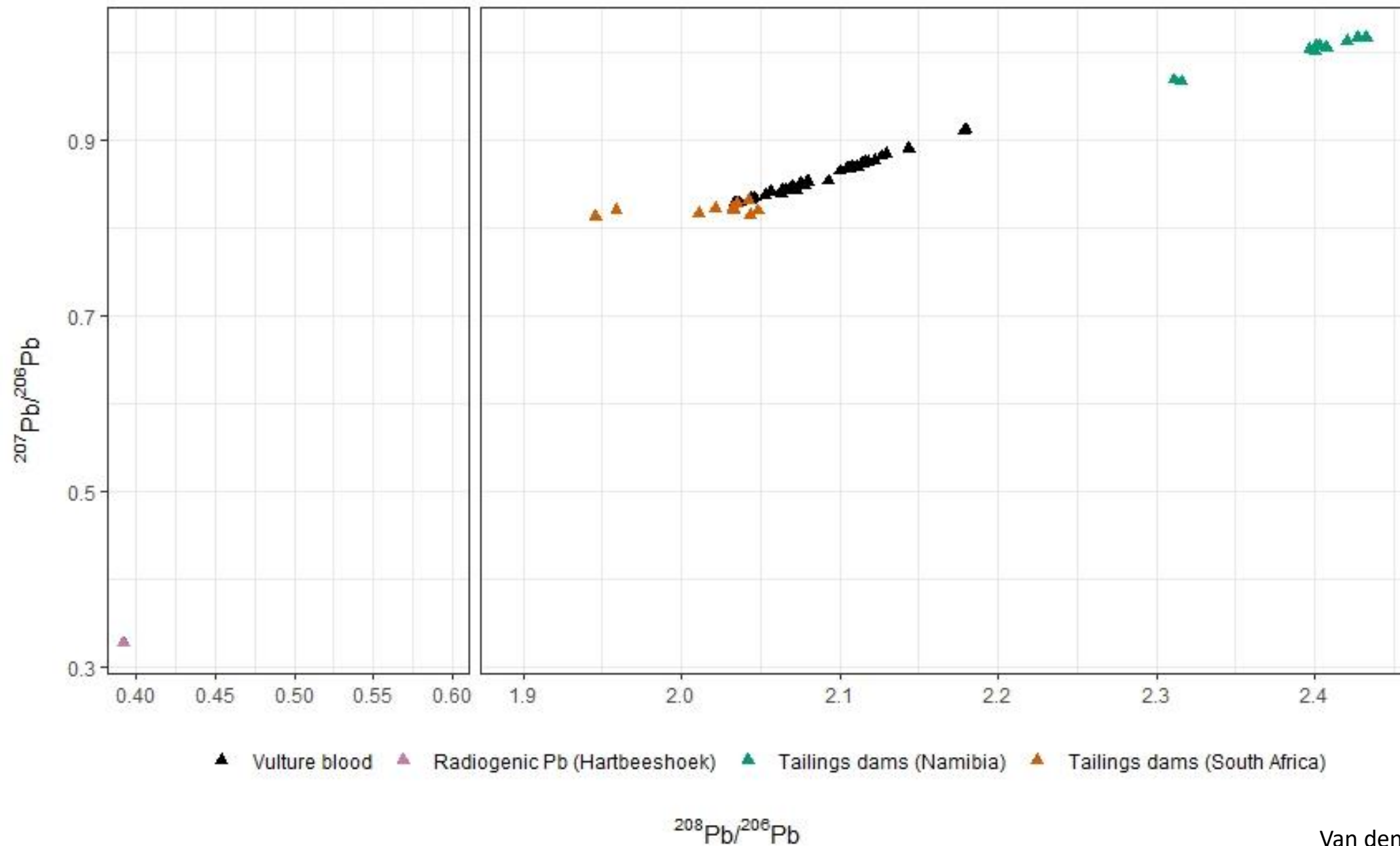
Lead extraction





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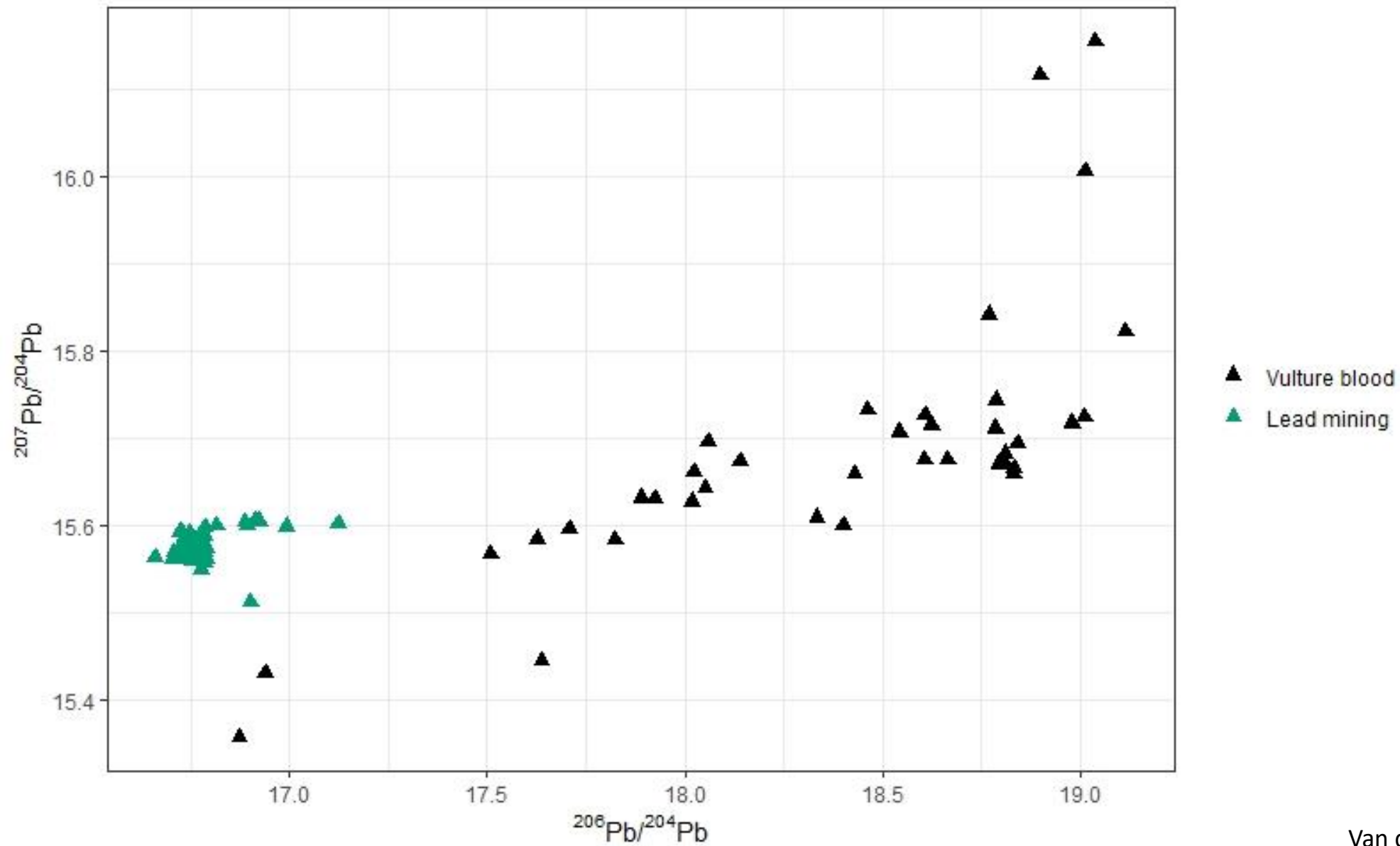
MC-ICP-MS



Uranium

Van den Heever et al. 2022

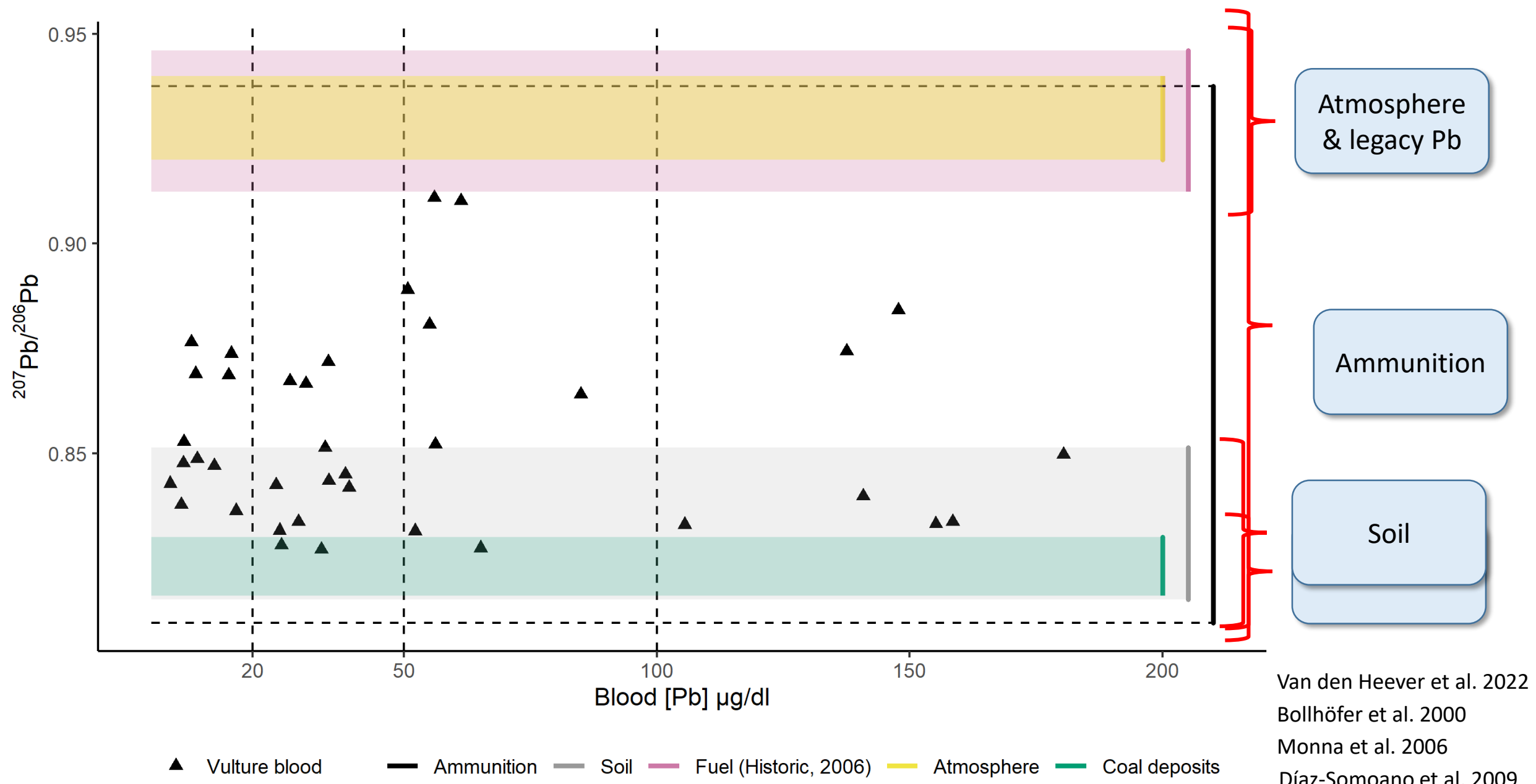
Kupi et al. 2020



Lead mining

Van den Heever et al. 2022

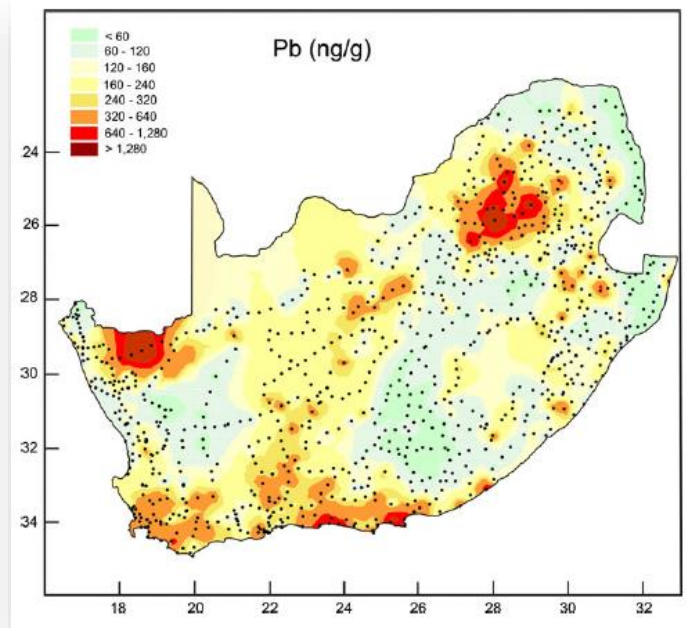
Reid et al. 1997



Ammunition vs soil

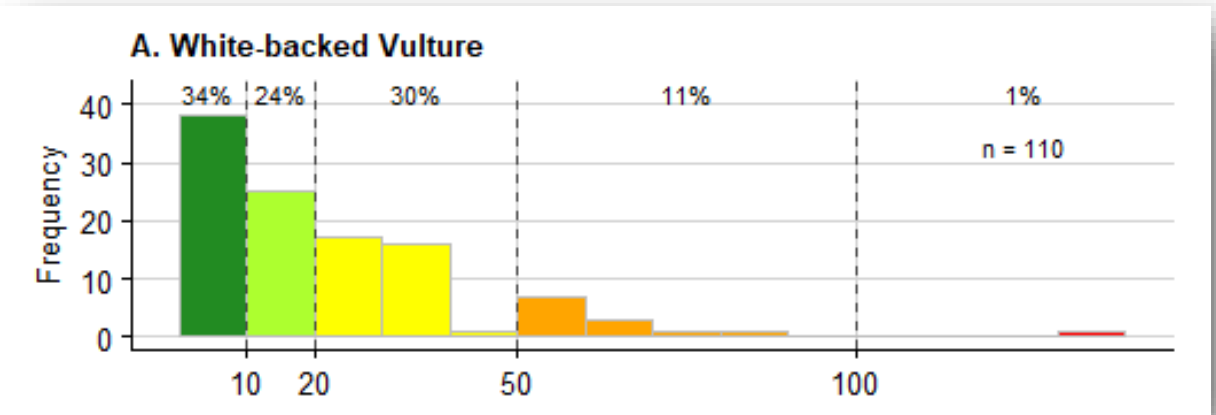
Soil

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

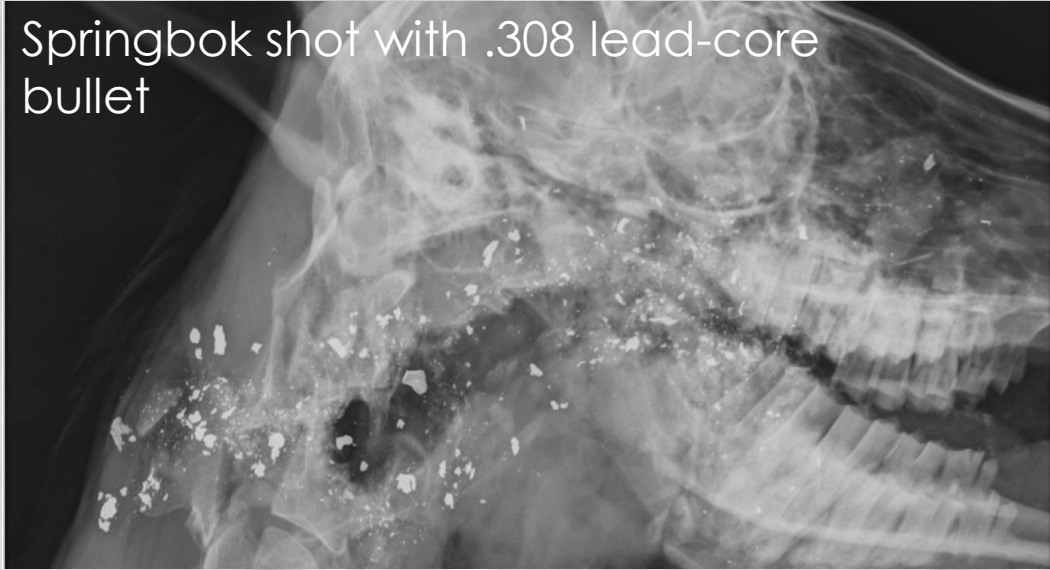


Ammunition

- 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**

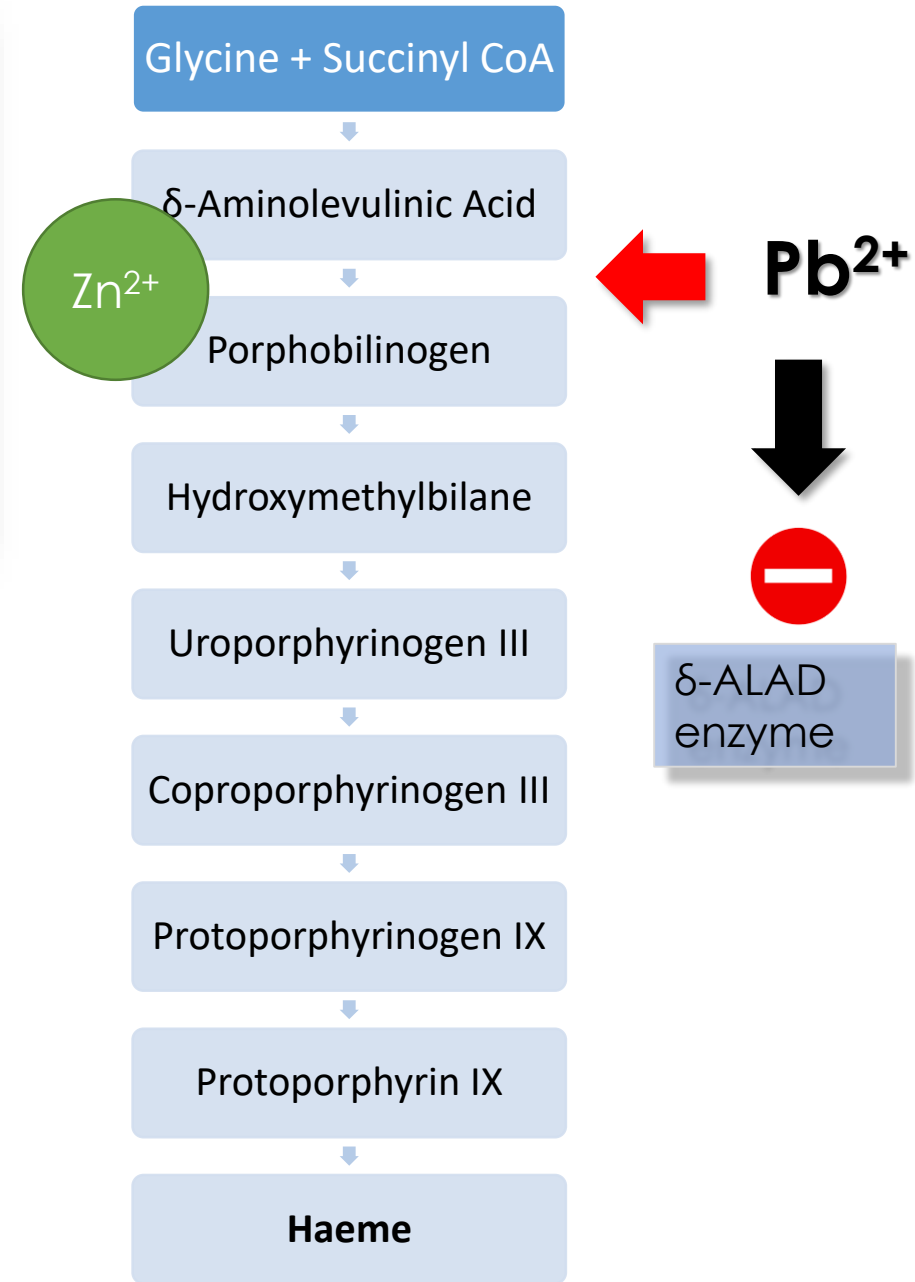
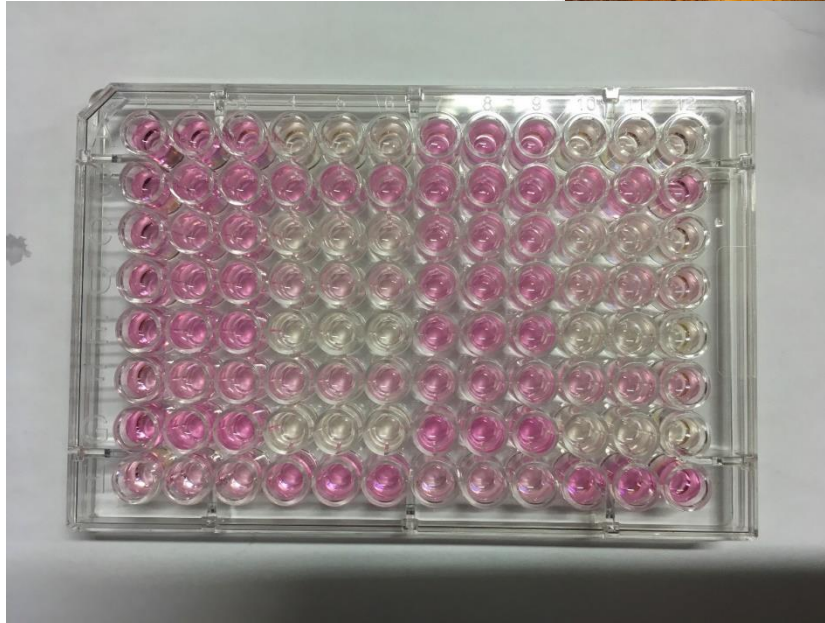
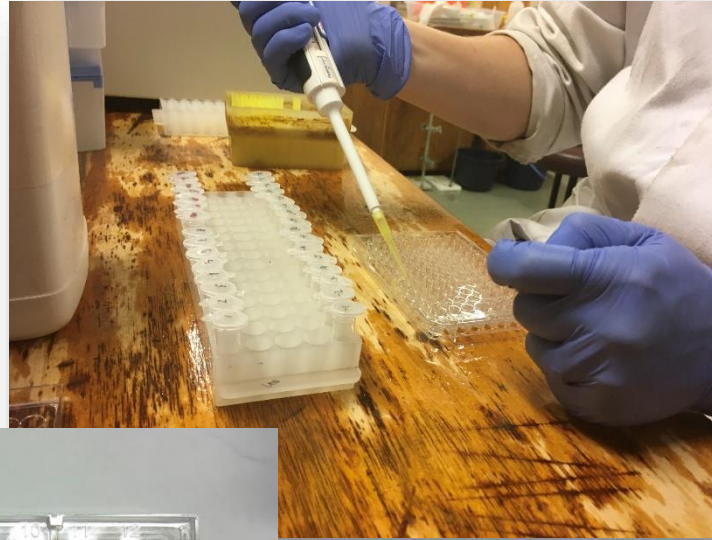
Where is the lead coming from?

Research questions

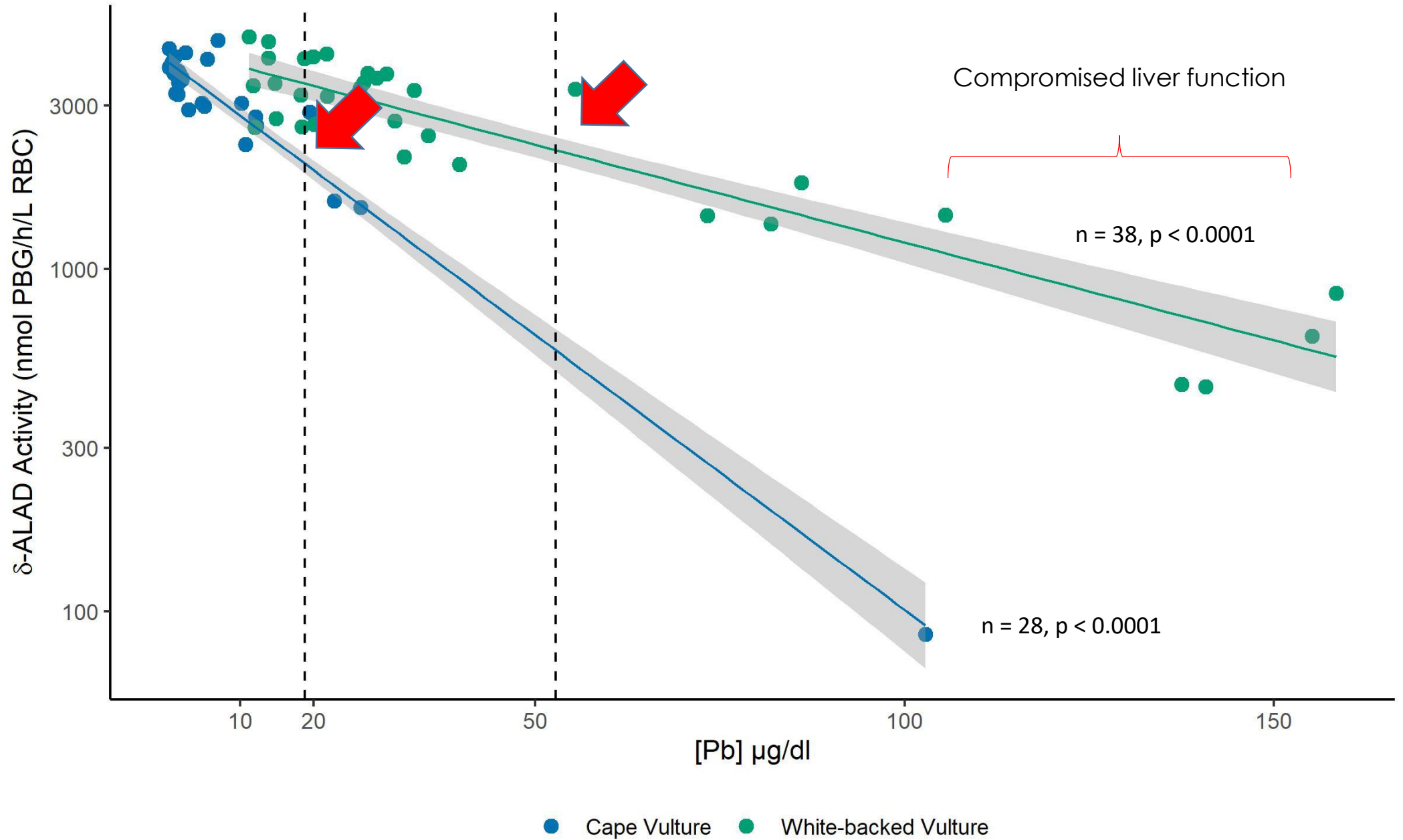
- What are the sub-lethal effects of lead in White-backed Vulture chicks?

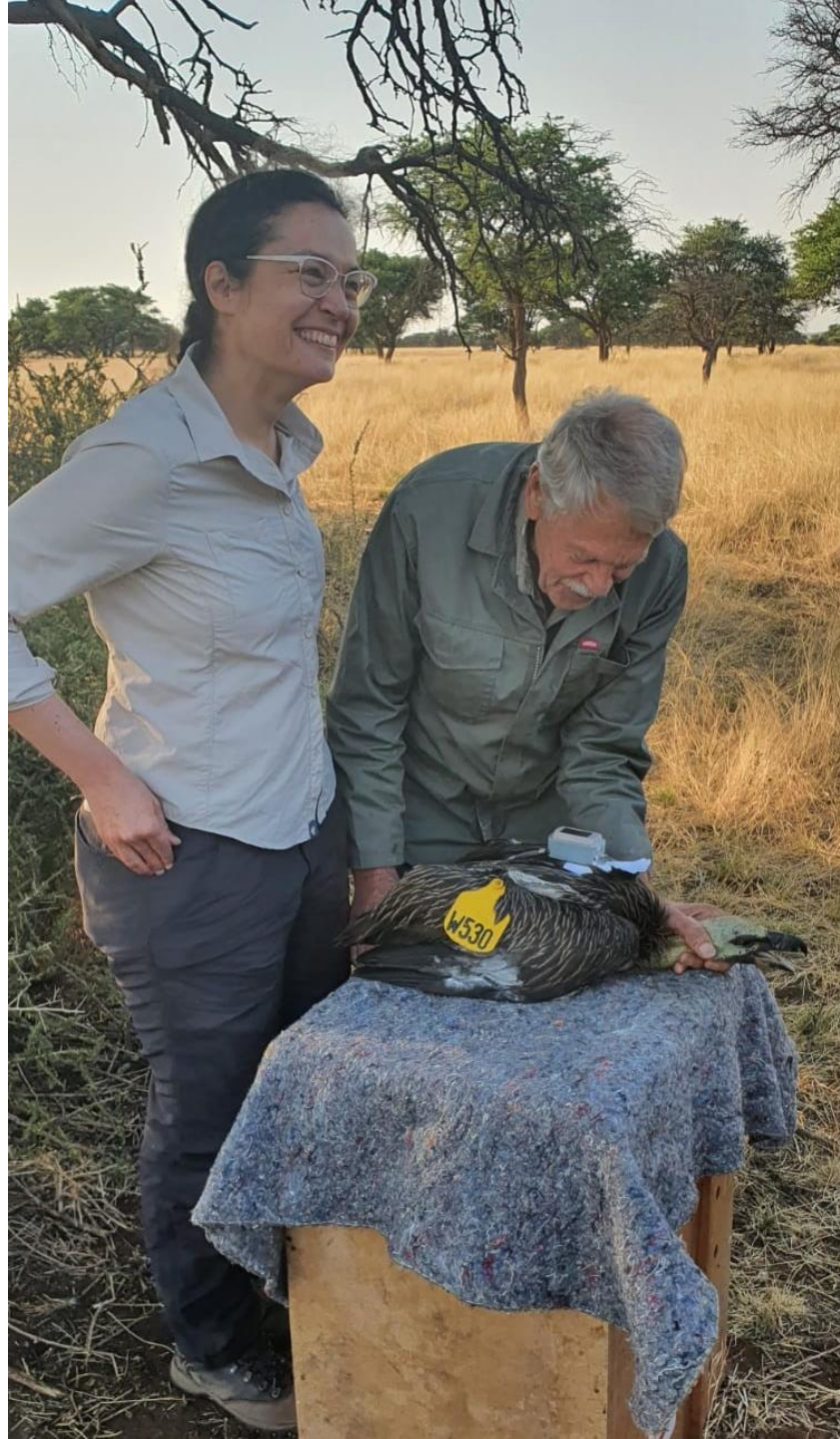


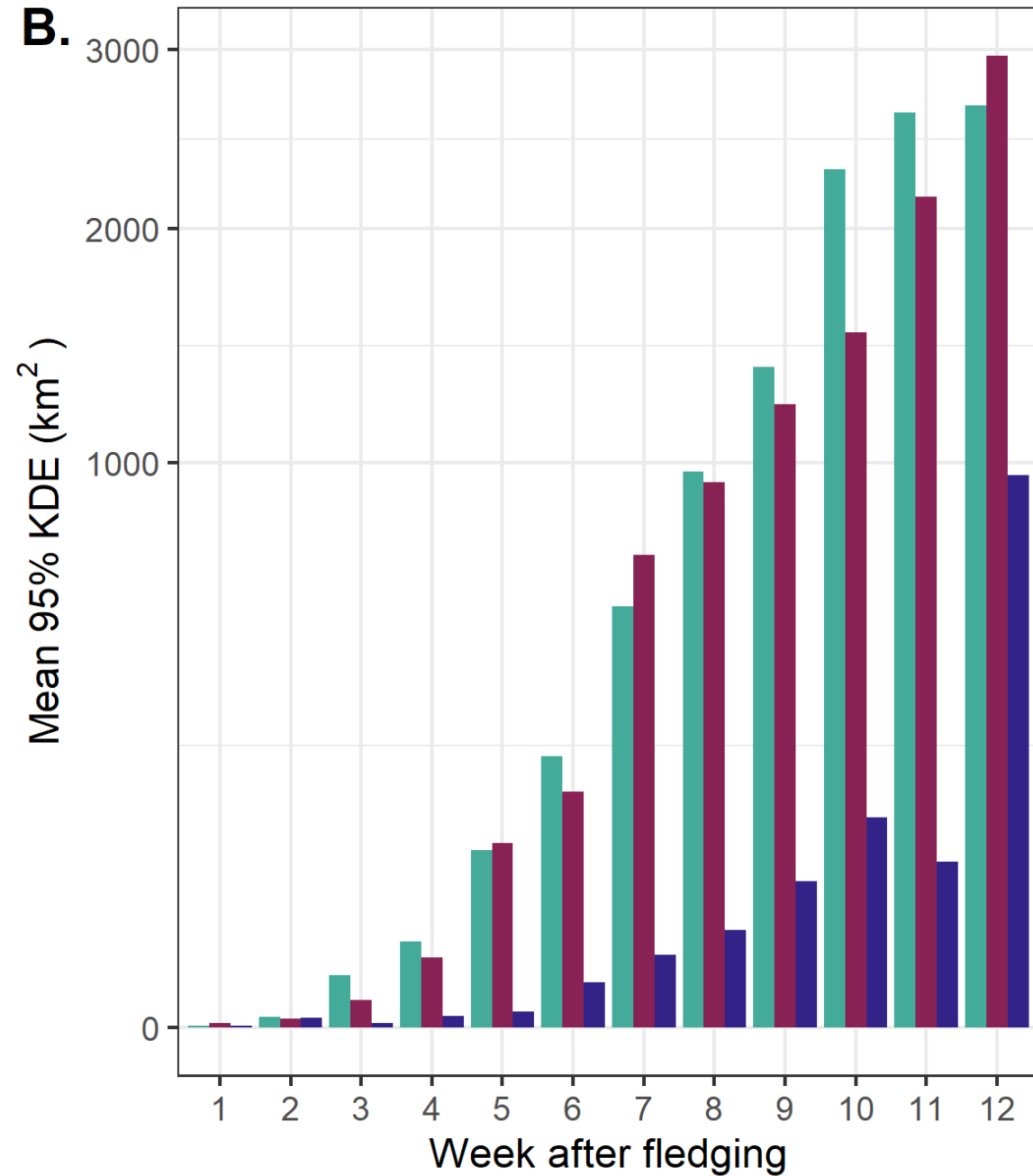
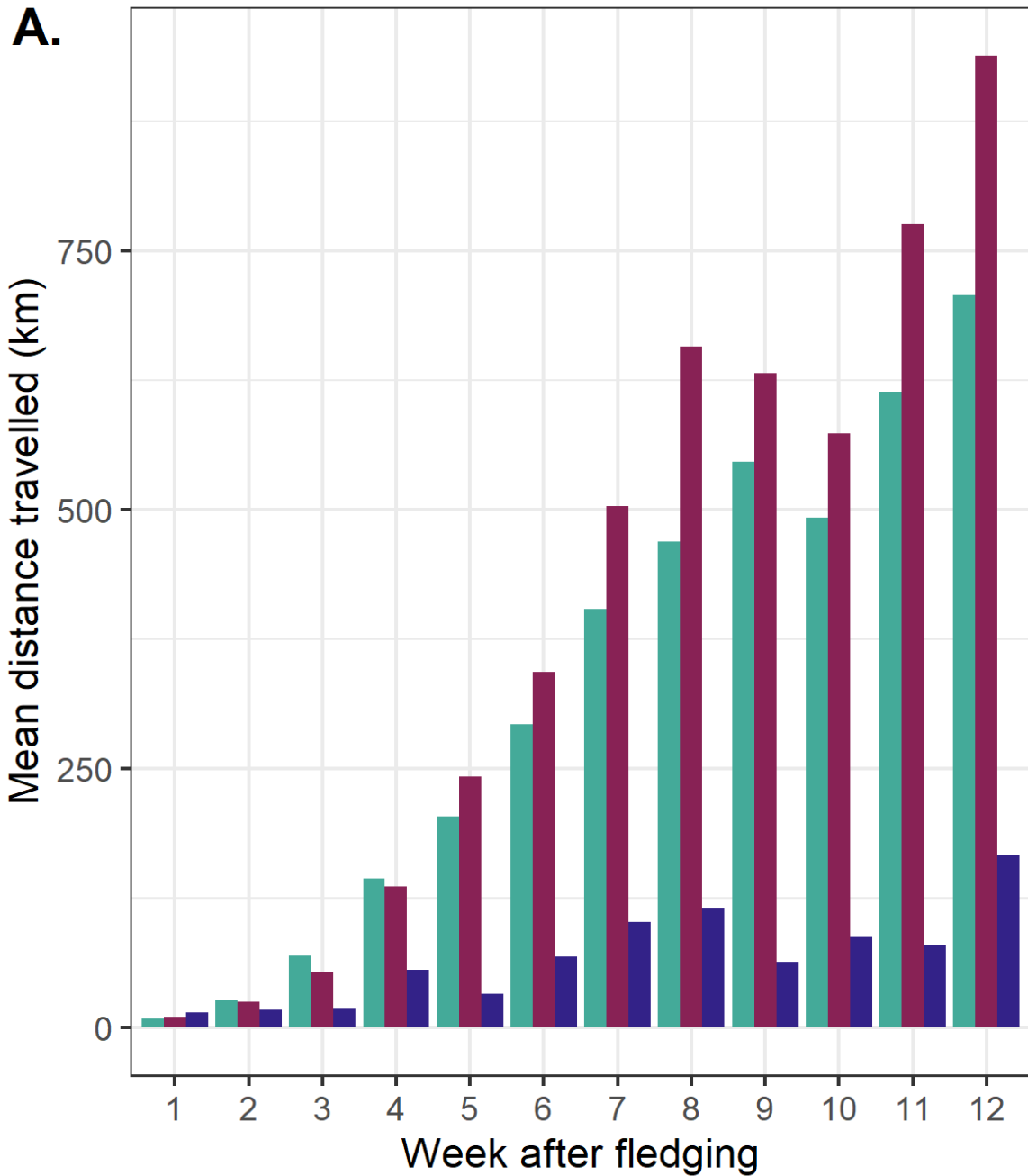
Haeme synthesis



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**



Challenges

- Lack of awareness
 - Vultures
 - Humans
- Availability of alternatives (specifically lead shot)
- Cost of alternatives
- Perceived as criticism of hunting



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

Lead advocacy

- New Vulture Conservation Officer: Justin Henry
 - Testing and development of lead-free alternatives
 - Engagement with game reserves, hunters and culling operators
- Assisting BirdLife Africa Partnership Secretariat
 - National workshops held in Malawi, Botswana, Zambia, Zimbabwe and Namibia
- Game meat harvesting protocol – Greater Kruger area
- Working with Medical Research Council to lower risk for workers on hunting farms
- Research
 - Testing Pb levels in venison



Thank you



Photo credits:
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Mark Anderson