

# The Scout's Warning: The Mercury Audit

## 1. The Briefing

You are a Lead Scout monitoring the health of the platypus population downstream from an old gold mine. Mercury (*Hg*) is a cumulative toxin. Toxicologists have established a strict **Danger Zone**: Any specimen with a concentration above **15.0 mg/kg** is at risk of neurological failure.

### Lead Scout's Mission

Determine if the creek is "safe." If any percentage of individuals are likely to be in the Danger Zone (**15.0 mg/kg**), you must issue a formal Warning to field staff.

## 2. Riley's Report

Junior researcher Riley has processed 218 specimens. She hands you a summary of her 95% Confidence Interval:

**95% Confidence Interval: [6.10, 8.28] mg/kg**

*"The data is in! Even the absolute highest mercury levels in this population are only 8.28 mg/kg... The creek is safe!" — Riley*

### Reflection: Initial Reaction

Based *only* on Riley's quote and the **15.0 mg/kg** threshold, does her logic seem sound to you? Why or why not?

## Step 1: Consult the Manual

To understand why Riley's report might be flawed, you need to understand the difference between estimating a *population* and predicting an *individual*.

**Bill the Statypus says:** "Confidence Intervals are for populations, but Prediction Intervals (PI) are for individuals. I wrote the `ConfIntFromSample` function so you can see both lenses at once."

**Action:** Open your laptop and navigate to [r.statypus.org](https://r.statypus.org) → **Section 10.3.3**. Read this section—specifically **Example 10.10**—before moving forward.

**Step 2: The Data Audit (Include Units: mg/kg)****Coding Corner: Bill's Audit Script**

Run the code in your R console:

```
load(url("https://statypus.org/files/StatypusCh10.RData"))
ConfIntFromSample( PlatypusData1$concentration )
```

Mean ( $\bar{x}$ ): \_\_\_\_\_ 95% CI: [ \_\_\_\_\_ , \_\_\_\_\_ ]

95% Prediction Interval (PI): [ \_\_\_\_\_ , \_\_\_\_\_ ]

**Calculation: The Field Sketch**

**Task:** Sketch the distribution between **0** and **30 mg/kg**. Mark the **mean**, the **CI** bar, the **PI** bracket, and the **15.0 mg/kg Danger Zone**.



**Safety Protocol: Expert Response**

**The Question:** A student researcher asks: "Riley said the average is safely below 15.0 mg/kg, so I don't need heavy gloves, right?" Write your professional safety guidance below.

**Bill's Insight: Inference vs. Prediction**

A CI tells us where the "average" individual is likely to be. A PI defines the boundaries where nearly all of the individuals live.