What do babies weigh at birth?
On average, a **baby girl in the US** weighs 7.4 lbs

95% of baby girls weigh between 5.5 and 9.3 lbs
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Let’s say 1 baby is born per day in Ames.

Over the next week, the baby weights are as follows:

Day 1 = 6.0
Day 2 = 6.5
Day 3 = 7.0
Day 4 = 7.5
Day 5 = 8.0
Day 6 = 8.5
Day 7 = 9.0
On average, a baby girl weighs 7.4 lbs

95% of baby girls weigh between 5.5 and 9.3 lbs

Let’s say 1 baby is born per day in Ames.

Over the next week, the baby weights are as follows. And this is highly statistically significant.

Day 1 = 6.0
Day 2 = 6.5
Day 3 = 7.0
Day 4 = 7.5
Day 5 = 8.0
Day 6 = 8.5
Day 7 = 9.0
Should we call the CDC?
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Of course not, it’s 7 days.

It’s most likely the luck of the draw.
5-year moving average nitrate load – Floyd River

5% chance

2019
5-year moving average nitrate load – Floyd River

Annual Nitrate-N Load

Metric tons N/year

[Graph showing annual nitrate load from 1985 to 2035]
5-year moving average nitrate load – Floyd River

- Annual Nitrate-N Load
- Metric tons N/year

- 68% chance
We’re trying to measuring trends owing to changes in cropping systems management in the context of weather.

Three factors affect our likelihood of measuring these trends:

i. Variability in nitrate levels in the absence of changes in land use and management.

ii. The magnitude of change.

iii. The timeline to reduction.
We’re trying to measuring trends owing to changes in cropping systems management in the context of weather.

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i. *Variability in nitrate levels in the absence of changes in land use and management.*

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iii. The timeline to reduction.

So just how long will it take?
• 44 Watersheds

• 2001-2018 records of water quantity and nitrate concentration

• A ‘real’ 41% reduction in 5-year moving average over:
  i. 5 years
  ii. 10 years
  iii. 15 years

• 3 ways we quantify nitrate levels:
  i. Flow-weighted concentration (mg nitrate-N per liter)
  ii. Load (lbs per watershed)
  iii. Yield (lbs per acre cropland)
What does this mean?

• On average, across all the watersheds, there is 93% chance of measuring a 41% reduction in 5-year moving average FWNC over 15 years, but only a 50% chance of measuring the same reduction in load.

• Changes in flow-weighted nitrate concentration can be measured faster than changes in load because they are less affected by weather.

• This analysis can be used to set realistic, watershed-specific expectations about measuring progress towards the INRS.
What can we do?

- What is the optimum sampling frequency to detect changes in FWNC, load and yield? Daily, weekly, monthly?
- What are the physical characteristics of watersheds where reductions can be measured relatively rapidly?
- How long will it take to measure smaller reductions?
- The opposite: what’s the likelihood of measuring false reductions (or increases) owing to weather rather than improvements in land use and management?
• Gerasimos (Makis) Danalatos, grad student in Agronomy at ISU, did all the work and makes some really cool maps.

• IDNR funded this work

• Adam Schnieders, Roger Bruner and Calvin Wolter provided insight and data.

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