Potential Connections Between Establishing Nutrient Requirements and Tolerable Upper Intake Levels

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“Nutrient risk assessment” is a broad term

- It can equally apply to the process of:
  - Determining requirements
  - Determining upper levels

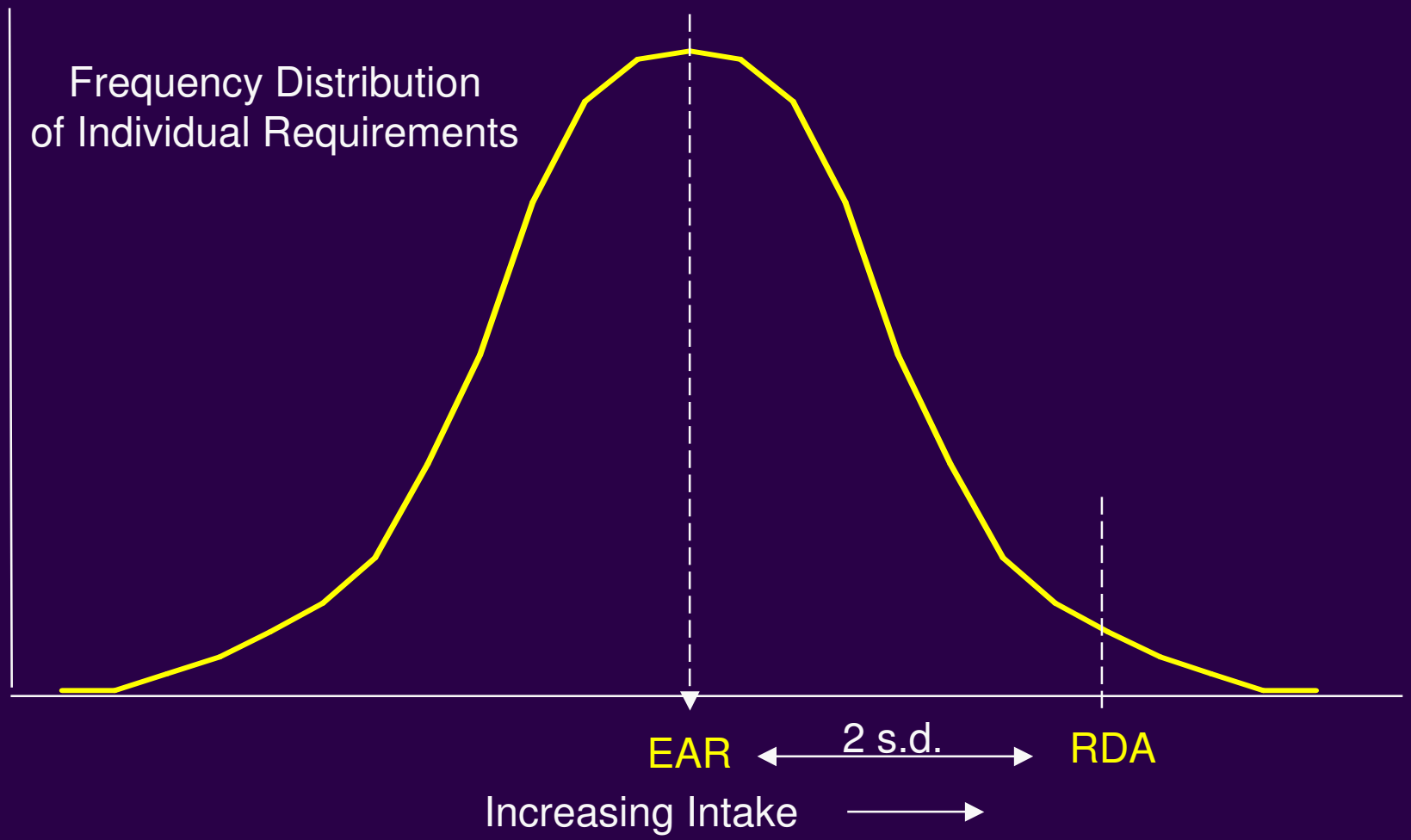
I’d like to pose the following questions

- Why are different approaches used to set nutrient requirements and upper levels?
- Are there risk assessment methods that are applicable to both?
- How do the different approaches limit the uses of the DRIs?

We use very different approaches to setting nutrient requirements vs. upper levels

- Requirements: Determine the average requirement and its standard deviation
- Upper levels: Use a risk assessment model

Setting a nutrient requirement



Setting a tolerable upper intake level (UL)

- Hazard identification
- Dose-response assessment
- Intake assessment
- Risk characterization

Why such different approaches?

- Nutrient excess is viewed as a “hazard” but nutrient deficiency is not?
- Too little of a nutrient is not “toxic” in the same way as too much of a nutrient?

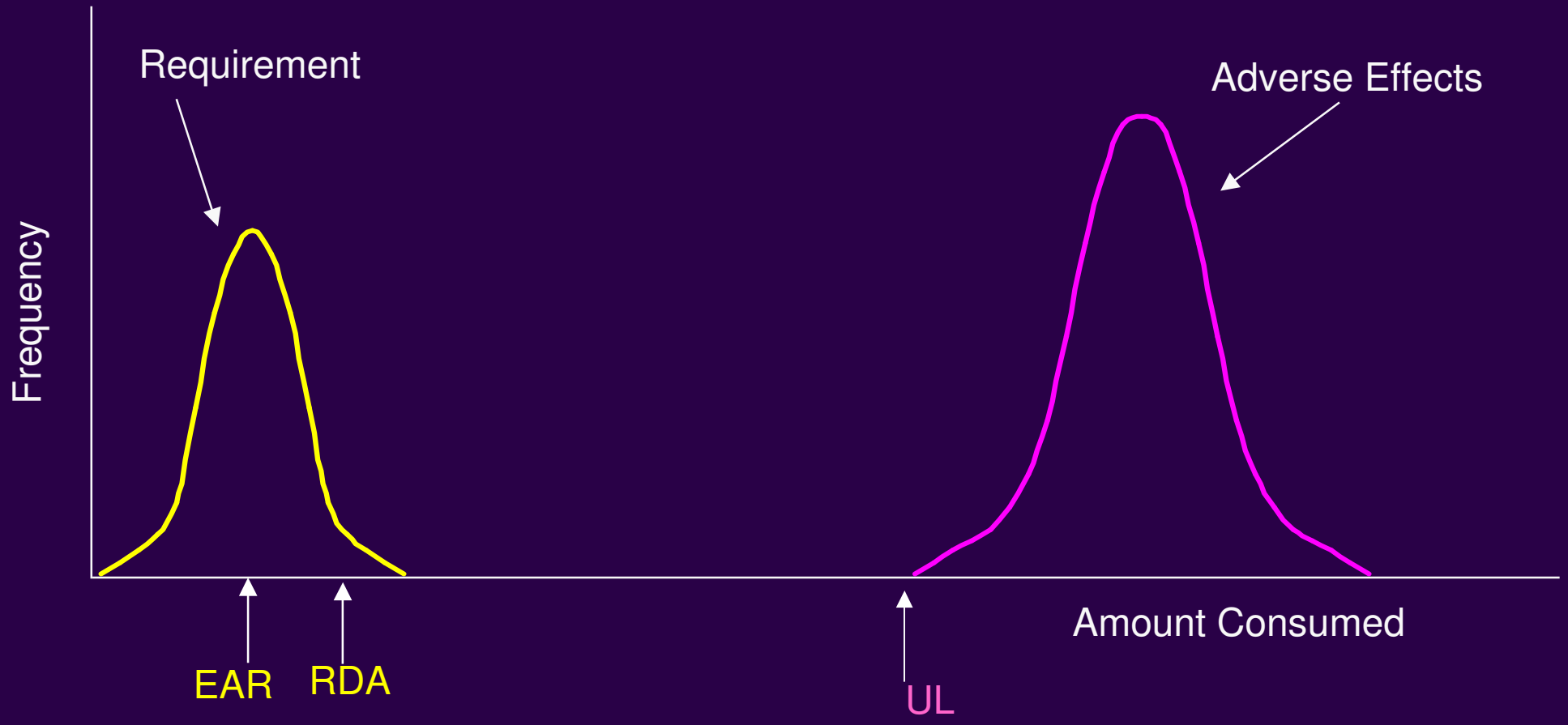
Can nutrient inadequacy be viewed as a hazard?

- By the definition of a “nutrient”, long-term inadequacy leads to:
  - Deterioration of health
  - Death

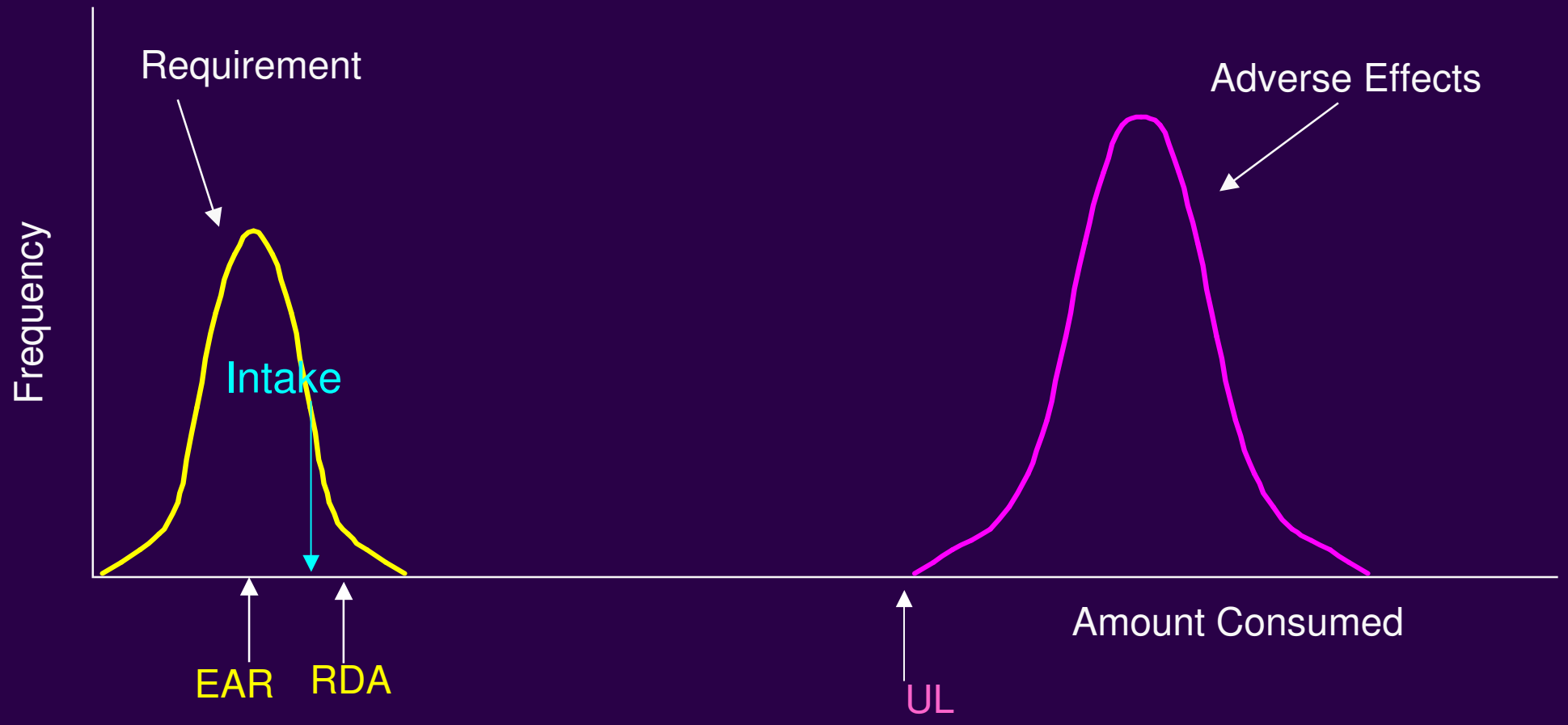
Why such different approaches?

- The concepts are not comparable?
  - The EAR/RDA describe a distribution of requirements.
  - The UL describes a threshold for risk of adverse effects.
- Why a distribution for one and a threshold for the other?

Both nutrient requirements and nutrient toxicities can be viewed as distributions



Intake at any level has a risk of being inadequate and a risk of being excessive



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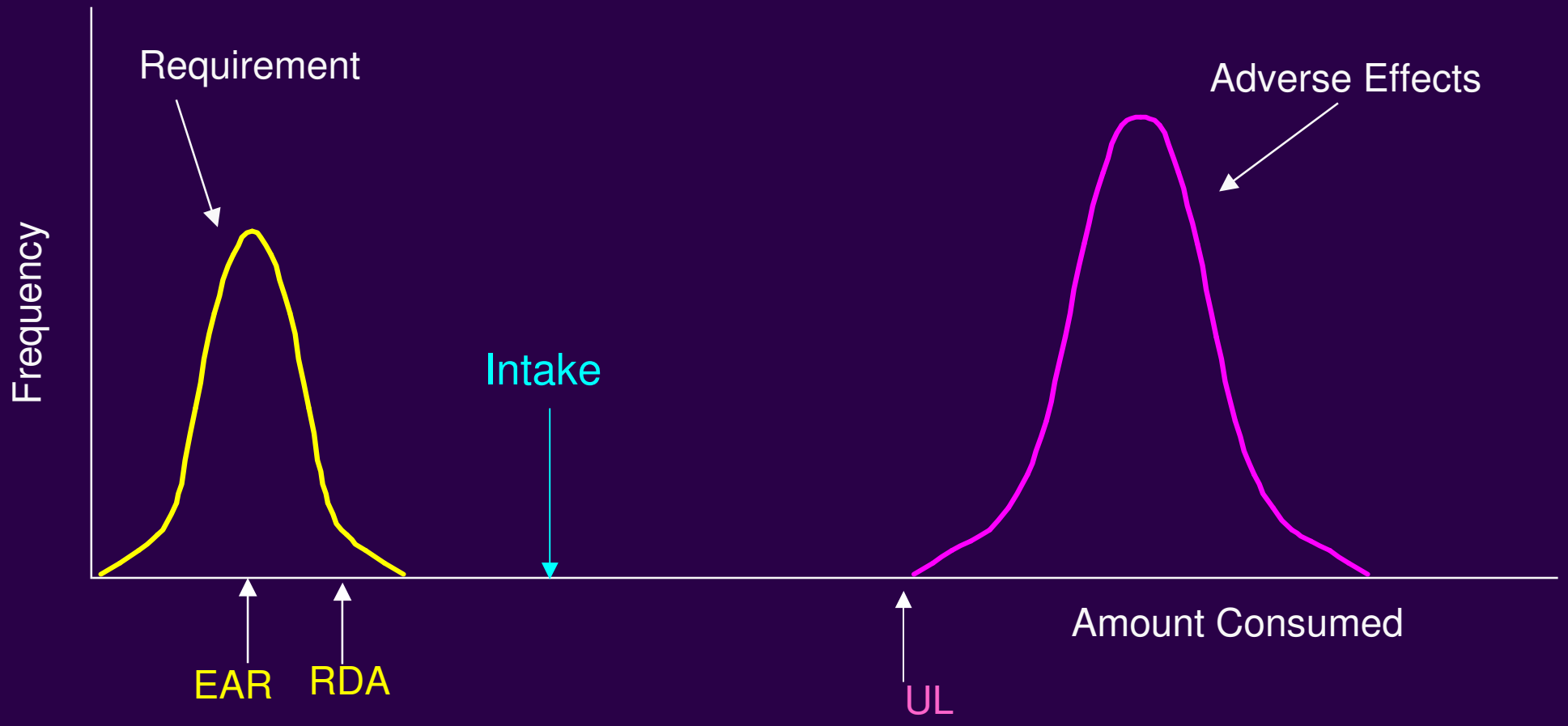

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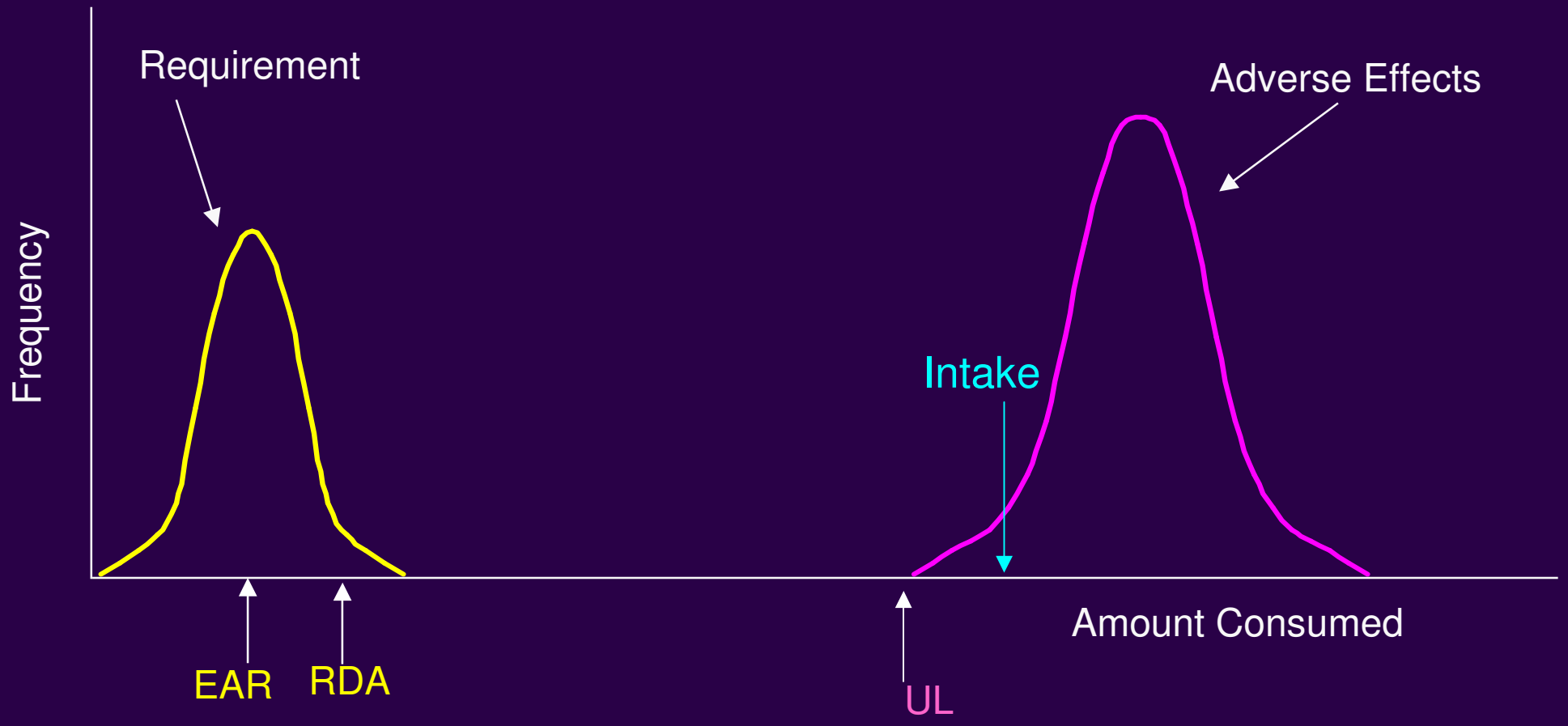
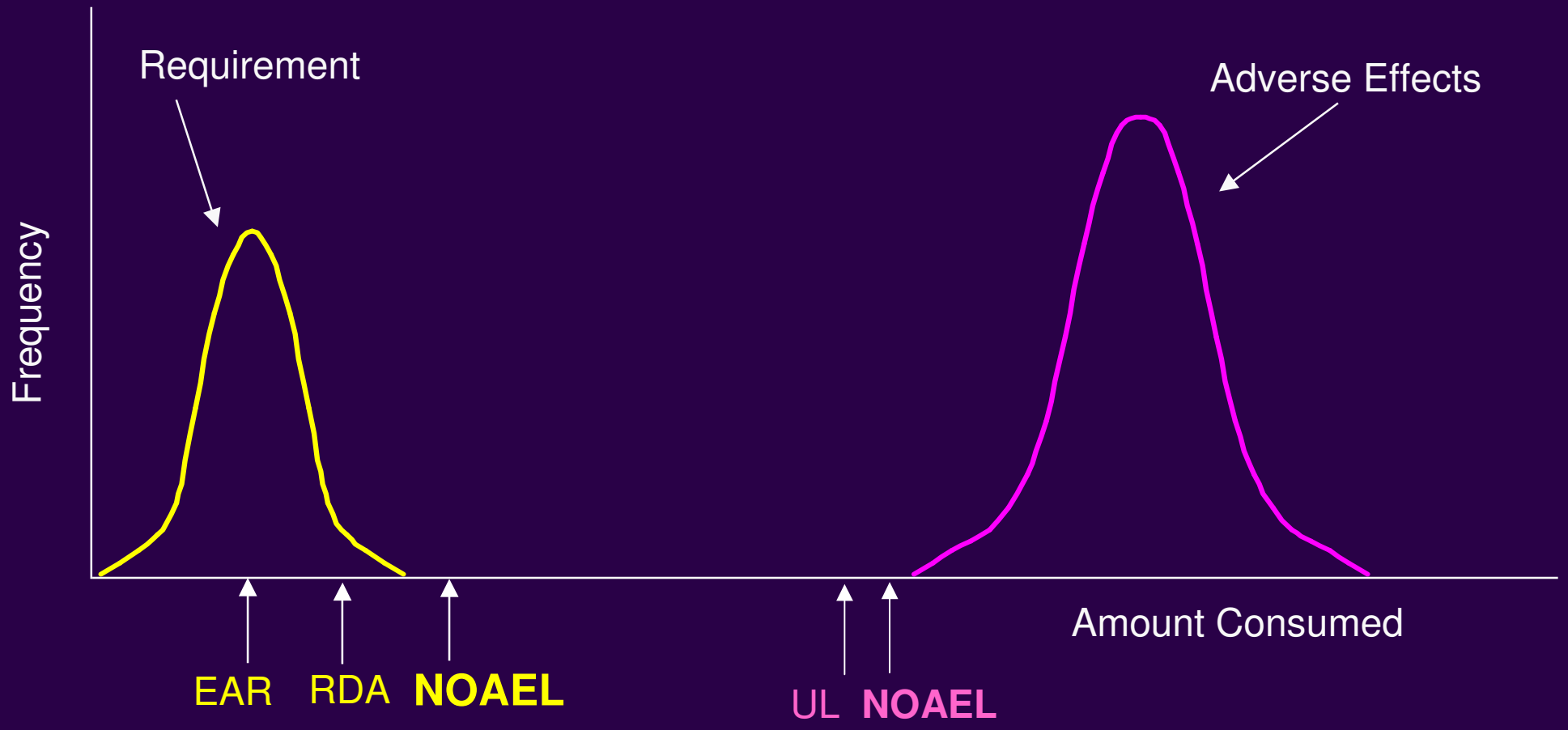


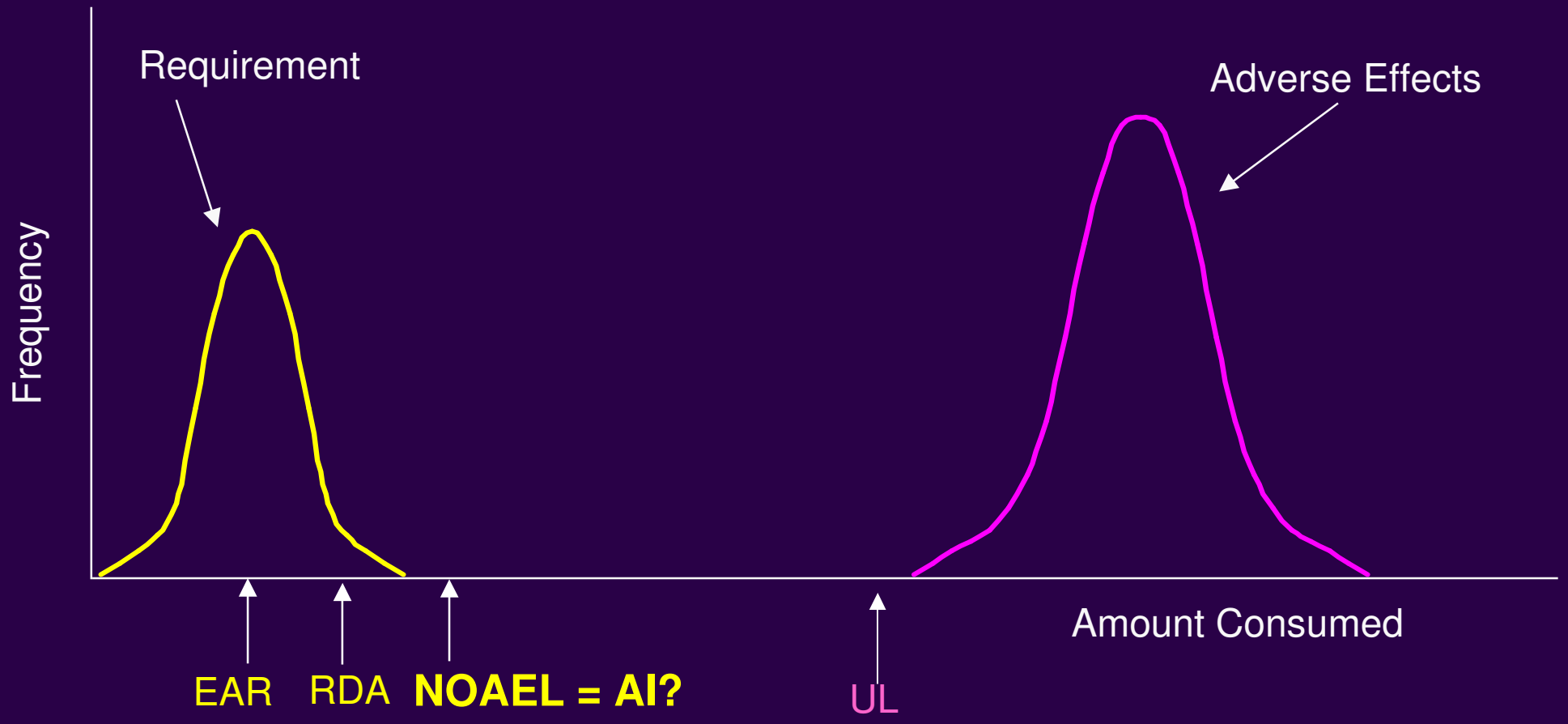
Are there risk assessment methods that are applicable to both requirements and ULs?

- The concepts of a LOAEL and NOAEL?
- Nutrient inadequacy could also be viewed as having a threshold like a NOAEL: no risk of inadequacy until intake falls below some level.

Does the concept of a NOAEL apply to requirements?



Are there similarities between a NOAEL and an Adequate Intake (AI)?



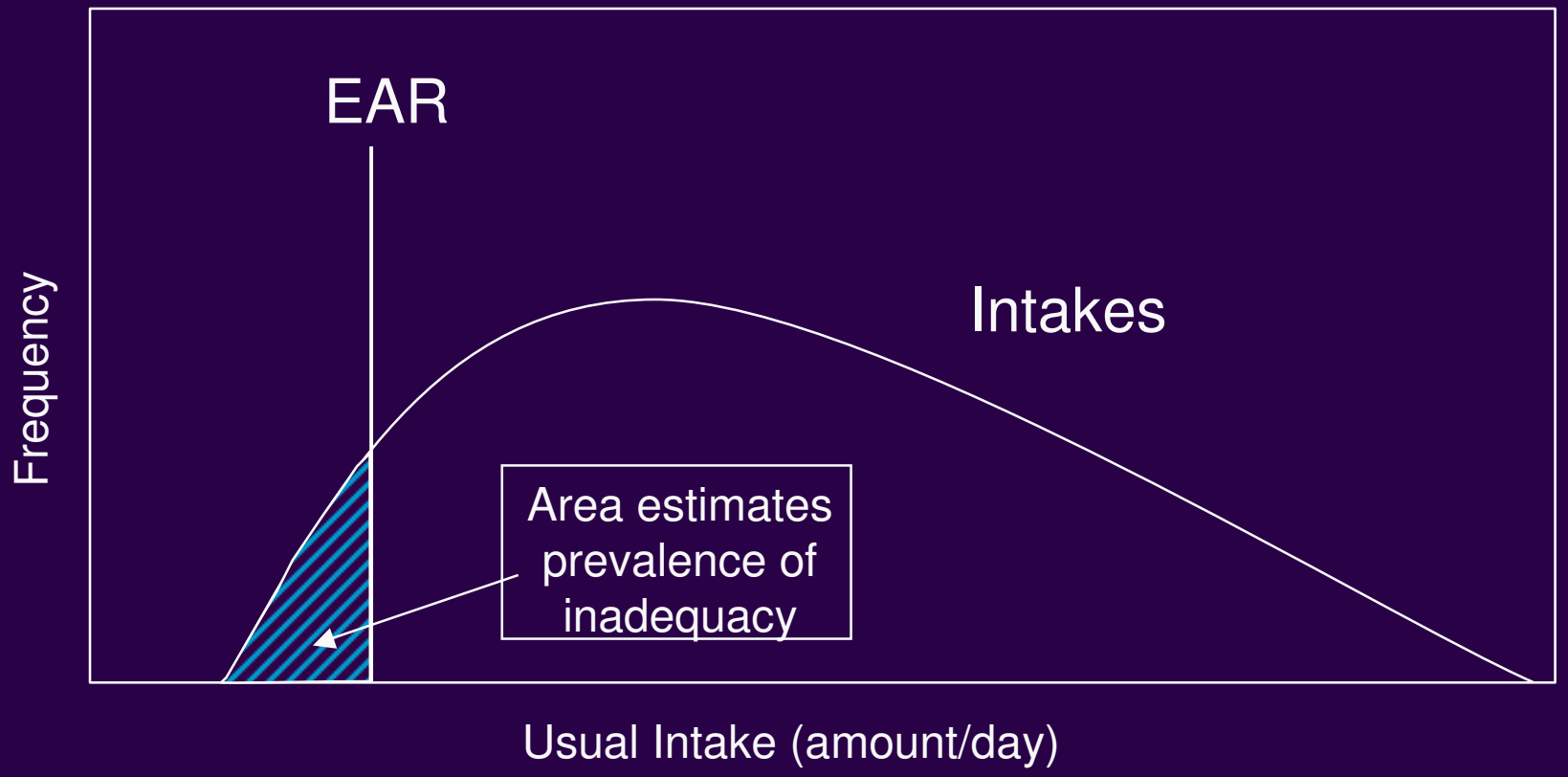
Should uncertainty factors be used when setting nutrient requirements?

- Uncertainty factors allow extrapolation from the observed data to the general population for a UL.
- There are also uncertainties in extrapolating data on requirements to the general population.

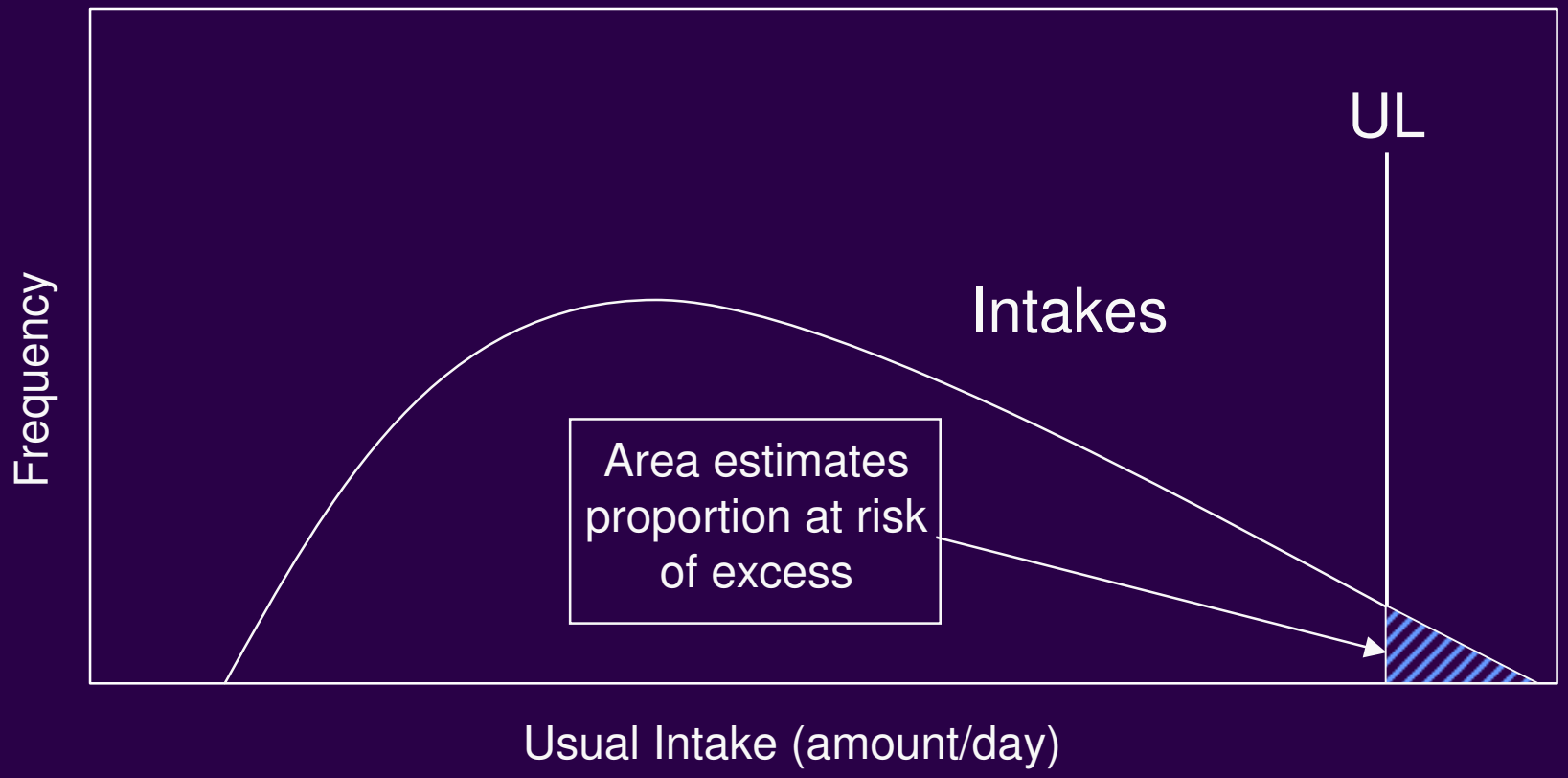
How do the different approaches limit the uses of the DRIs?

- Knowing a distribution of requirements allows an estimate of the prevalence of inadequacy.
- Knowing a threshold for adverse effects allows an estimate of the proportion of the population at risk of adverse effects.

Group prevalence of inadequate intakes



Group prevalence of inadequate intakes



An example using the WIC population

- Evaluation of potential benefits and risks of revising the WIC food packages
- Benefit defined as:
  - Reduction in the prevalence of inadequate nutrient intake
  - Reduction in the prevalence of excessive nutrient intake
- Risk defined as an increase in either of these

Potential Benefit: Reduction in the prevalence of inadequate iron intakes

- Non-breastfeeding women:
  - Current prevalence: 9.5%
  - Revised prevalence: 4.6%
  - Should be measurable as a significant decline in women with poor iron status

Potential Benefit: Reduction in the prevalence of excessive vitamin A intakes

- Infants 6-12 months, formula-fed:
  - Current prevalence: 43%
  - Revised prevalence: 30%
  - Not clear if a reduction in adverse effects would be expected (e.g., anorexia, hyper-irritability, skin lesions)

Recommendation

- Conduct a review of the models used for setting requirements and upper levels
- Goals of the review:
  - Identify commonalities
  - Better align the methodology

Conclusions

- A more consistent approach across the DRIs could increase their:
  - Scientific credibility
  - Usefulness in assessing and planning intakes