TOLERABLE UPPER INTAKE LEVEL (UL)

The highest level of nutrient intake that is likely to pose no risk of adverse health effects for almost all individuals in the general population. As intake increases above the UL, the risk of adverse effects increases.

"AGENTS" THAT ARE POTENTIAL SOURCES OF FOOD-RELATED RISKS

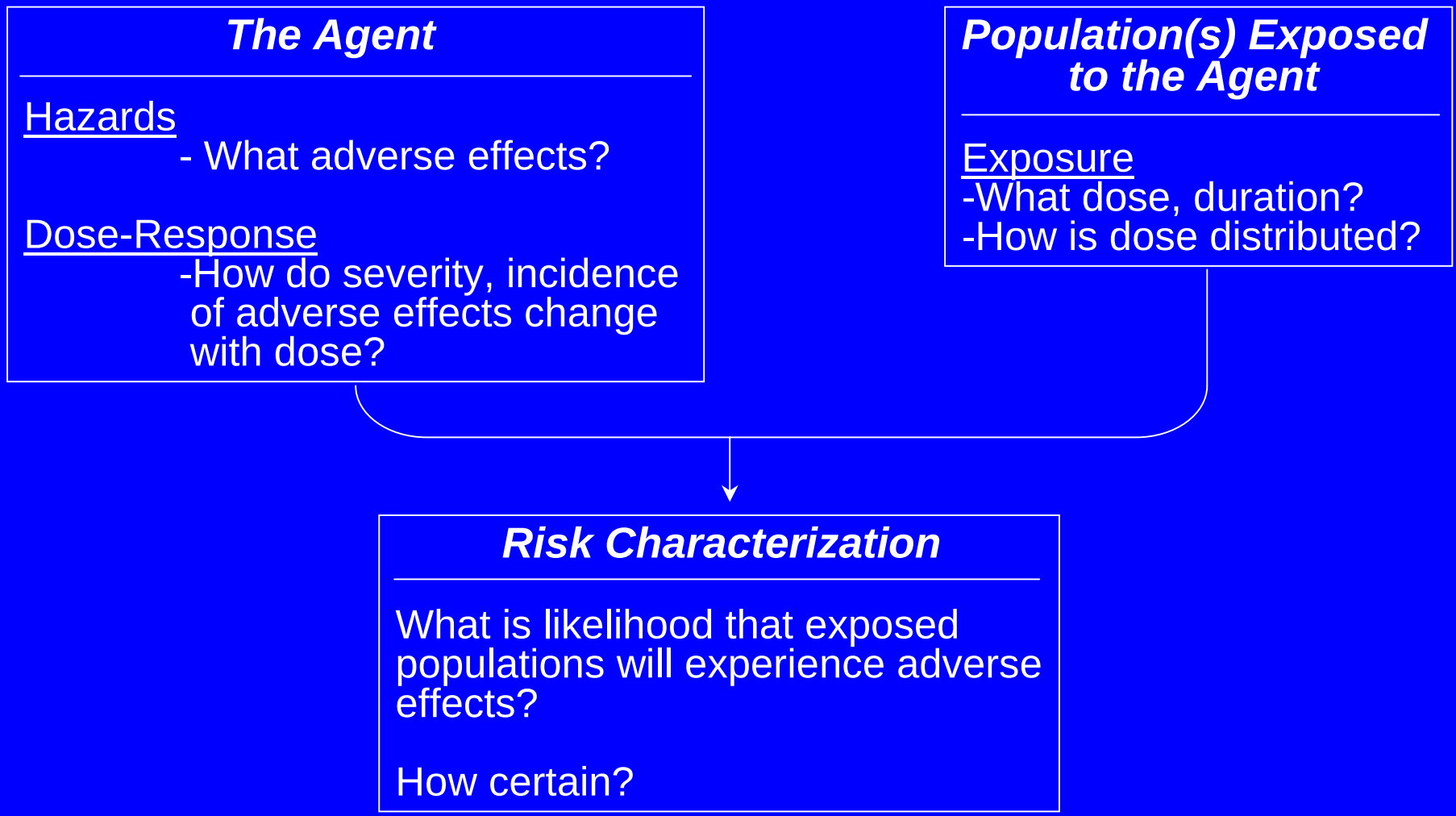
[1] Natural Constituents
- Nutrients
- Non-nutrients

[2] Substances Intentionally and Directly Added

[3] Substances Indirectly Added
- Pesticides
- Indirect Food Additives

[4] Contaminants
- Naturally Occurring Chemicals
- Industrial Products, By-products
- Biological Agents

RISK ASSESSMENT INVOLVES SYSTEMATIC ORGANIZATION AND EVALUATION OF DATA



HAZARDS OF CHEMICAL AGENTS

- Many Forms of Toxicity
- Vary With the Chemical, Its Dose, and the Duration of Exposure
- Toxicity Expressed When Threshold Dose Is Exceeded
- Thresholds Vary Among Individuals
- Carcinogens May Not Exhibit Thresholds

DEVELOPMENT OF TOLERABLE UPPER INTAKE LEVELS (ULs)

Components of Hazard Identification

- Evidence of adverse effects in humans
- Causality
- Relevance of experimental data
- Pharmacokinetic and metabolic data
- Mechanisms of toxic action
- Quality and completeness of the database
- Identification of distinct and highly sensitive subpopulations

DEVELOPMENT OF TOLERABLE UPPER INTAKE LEVELS (ULs)

Components of Dose-Response Assessment

- Data selection and identification of critical endpoints
- Identification of no-observed-adverse-effect level (NOAEL) (or lowest-observed-adverse-effect level [LOAEL])
- Assessment of uncertainty and data on variability in response
- Derivation of a UL
- Characterization of the estimate and special considerations

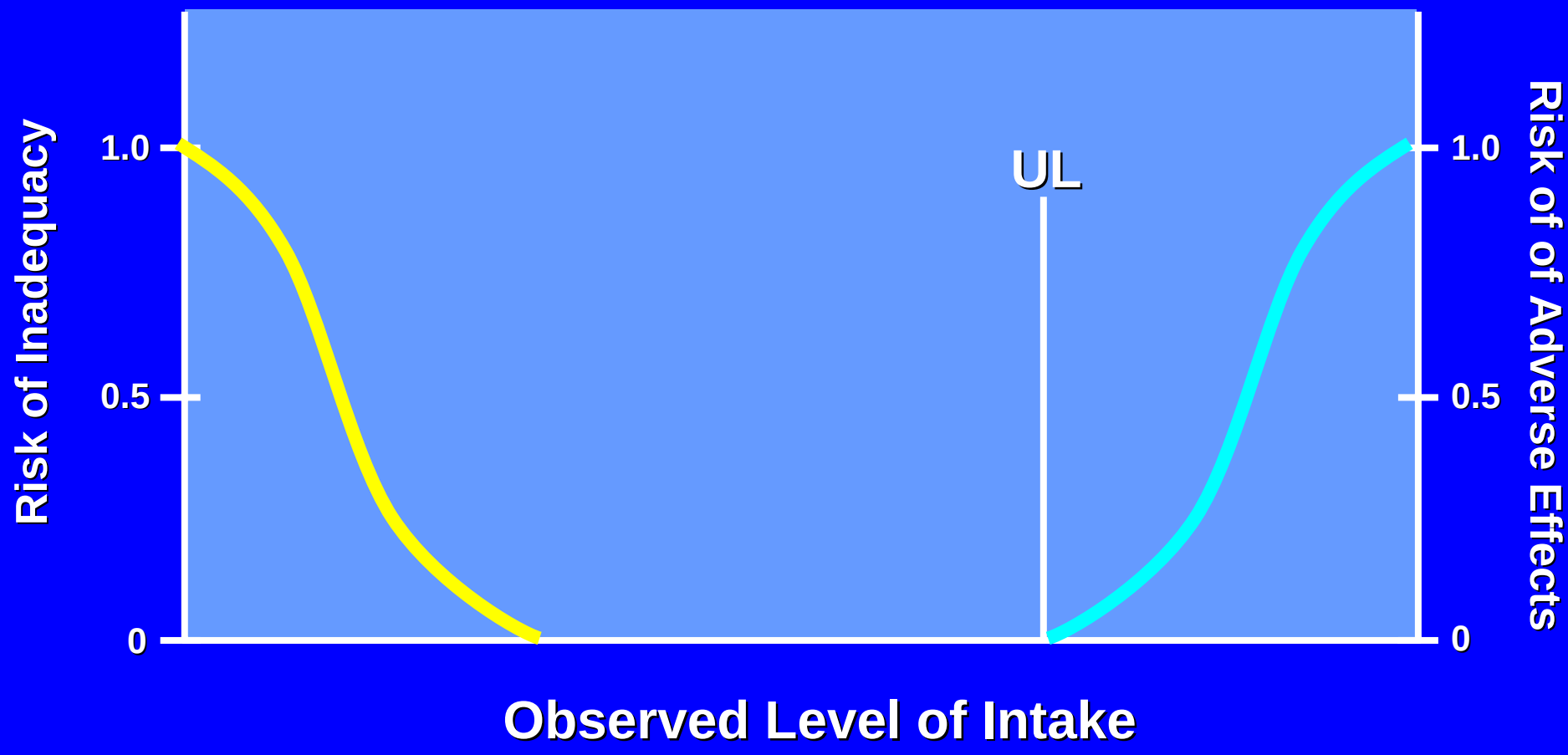
UNCERTAINTIES

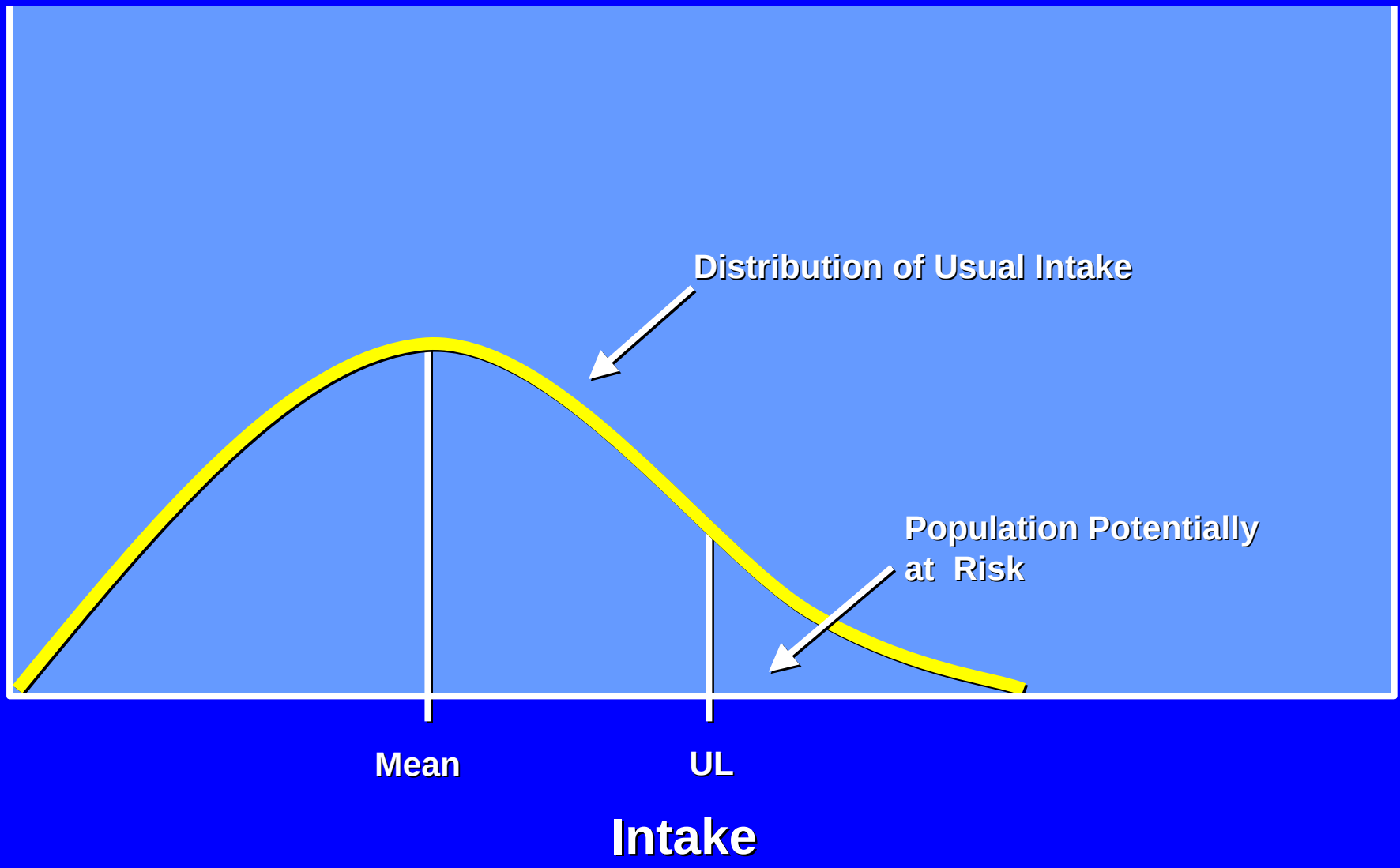
- Limitations in available HUMAN STUDIES
- Limitations in and relevance of EXPERIMENTAL DATA
- Estimating Threshold (UL) for Large, Diverse Human Population
  - VARIABILITY IN RESPONSE
  - ANIMAL-HUMAN DIFFERENCES

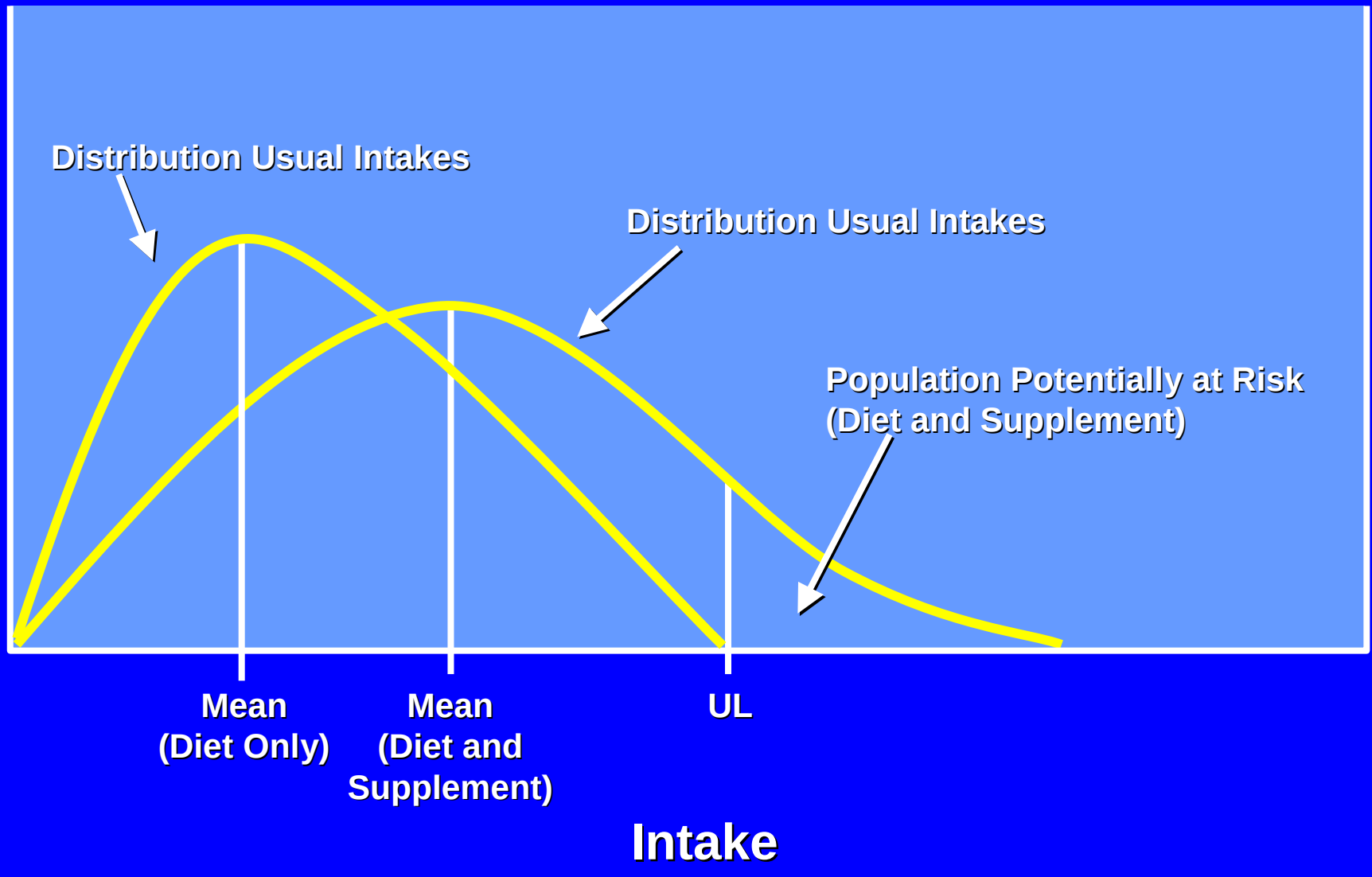
UNCERTAINTY FACTORS ARE USED TO DEAL WITH THESE & OTHER UNCERTAINTIES

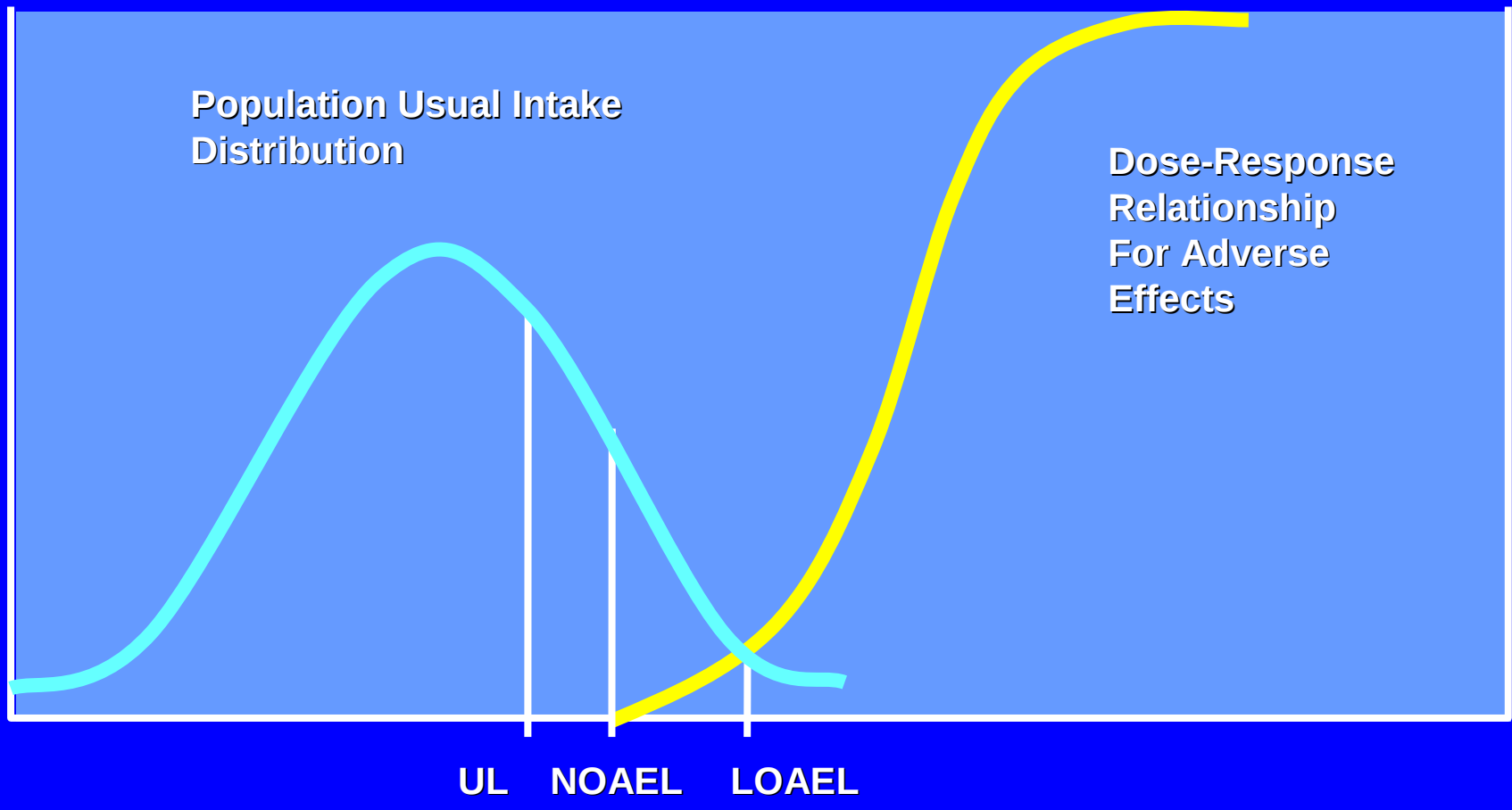
TOLERABLE UPPER INTAKE LEVELS (ULs) BY LIFE STAGE GROUP

Life Stage Group	Vitamin C (mg/d)	“-Tocopherol (Mg/d)	Selenium (µg/d)
0 through 6 mo	ND	ND	45
7 through 12 mo	ND	ND	60
1 through 3 y	400	200	90
4 through 8 y	650	300	150
9 through 13 y	1,200	600	280
14 through 18 y	1,800	800	400
19 through 70 y	2,000	1,000	400
>70 y	2,000	1,000	400
Pregnancy			
#18 y	1,800	800	400
19 through 50 y	2,000	1,000	400
Lactation			
#18 y	1,800	800	400
19 through 50 y	2,000	1,000	400


Risk of Inadequacy
1.0
0.5
0
UL
Risk of Adverse Effects
1.0
0.5
0
Observed Level of Intake


Distribution of Usual Intake
Population Potentially at Risk
Mean
UL
Intake


Distribution Usual Intakes
Distribution Usual Intakes
Population Potentially at Risk
(Diet and Supplement)
Mean
(Diet Only)
Mean
(Diet and
Supplement)
UL
Intake


Population Usual Intake Distribution
Dose-Response Relationship For Adverse Effects
UL
NOAEL
LOAEL
Intake