Risk Management Approach for the Corrective Measures Study

Air Deposition Area and
Culvert 105

FMC Middleport

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How is Risk Assessment Used in the CMS?

- Purpose of the *corrective measures study (CMS)*:
  - Develop, evaluate, justify, and recommend corrective measure(s)
- How will a *human health risk assessment (HHRA)* support the CMS?
  - Development of one or more risk-based CMS alternatives
  - Evaluation of CMS alternatives for protectiveness of human health (one of several evaluation criteria)
  - Response to community concerns and facilitation of community participation

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Risk Assessment Goal

To provide a comprehensive HHRA that most effectively utilizes Middleport-specific data and best supports the development of effective CMS alternatives.

- Over 1800 surface soil samples
- Bioavailability Studies
- Biomonitoring Study
- Indoor Dust Samples
- Homegrown Produce
- Current Survey

Key Questions for Risk Assessment

- What areas are being assessed?
- What environmental media *may be* affected? (Soil, house dust, air, homegrown produce)
- How do people contact these media? (i.e., what are the exposure routes?)
- What chemicals are of concern? (arsenic, any others?)
- What parameters govern how much exposure people have? (exposure frequency and duration, bioavailability, periods of inclement weather, ingestion rates, etc.)
- What data do we have and what is the data quality?

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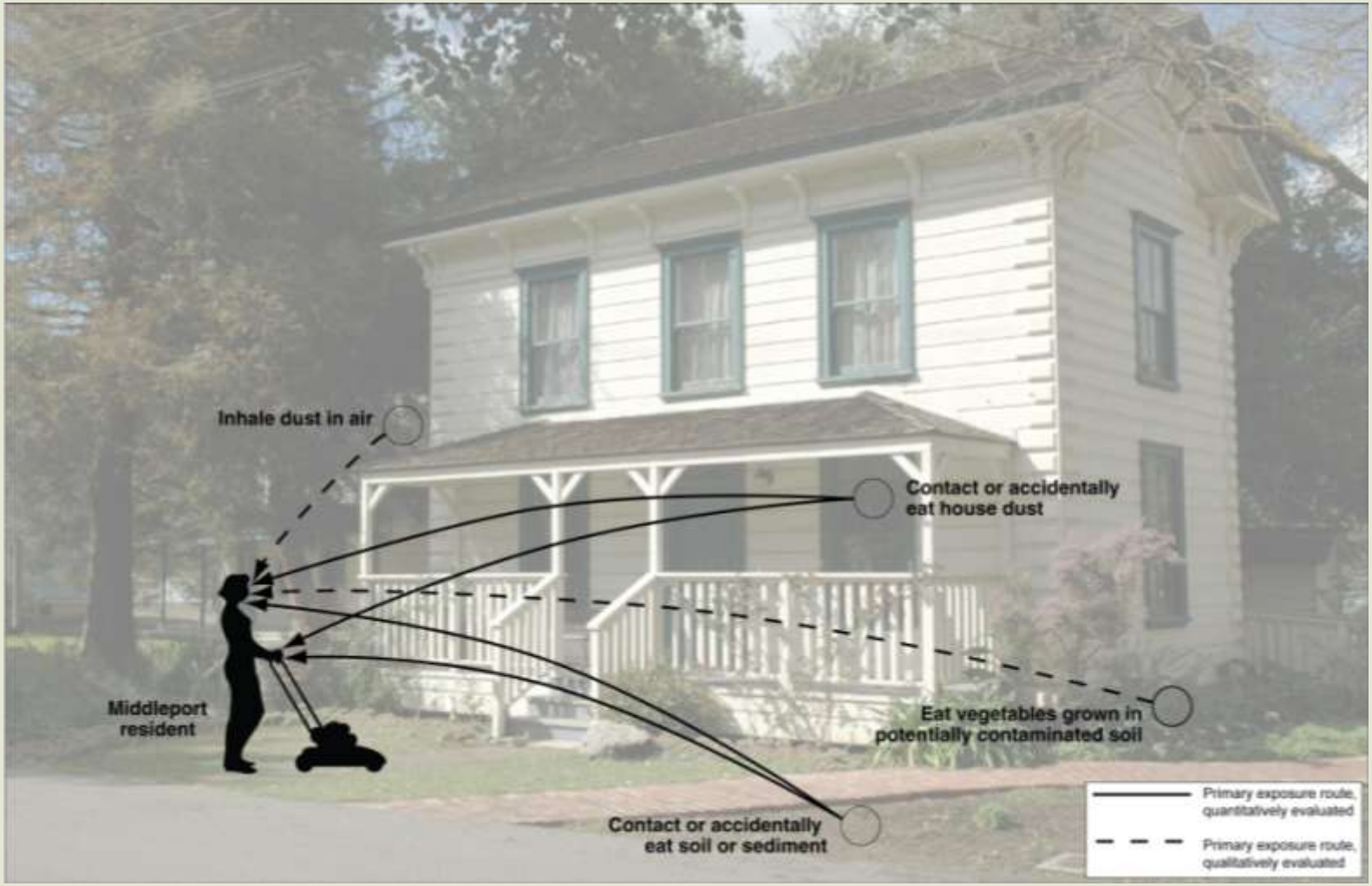
What Areas are Being Assessed? (See Display Board)

- Surface soils within the air deposition area
- Surface soils/sediments along Culvert 105 north of the canal
- Subsurface soils/sediments along Culvert 105 north and south of the canal

Conceptual Site Model:
How Might People Contact These Media?



What Chemicals are of Concern?
Constituent of Concern (COC) Screening Process

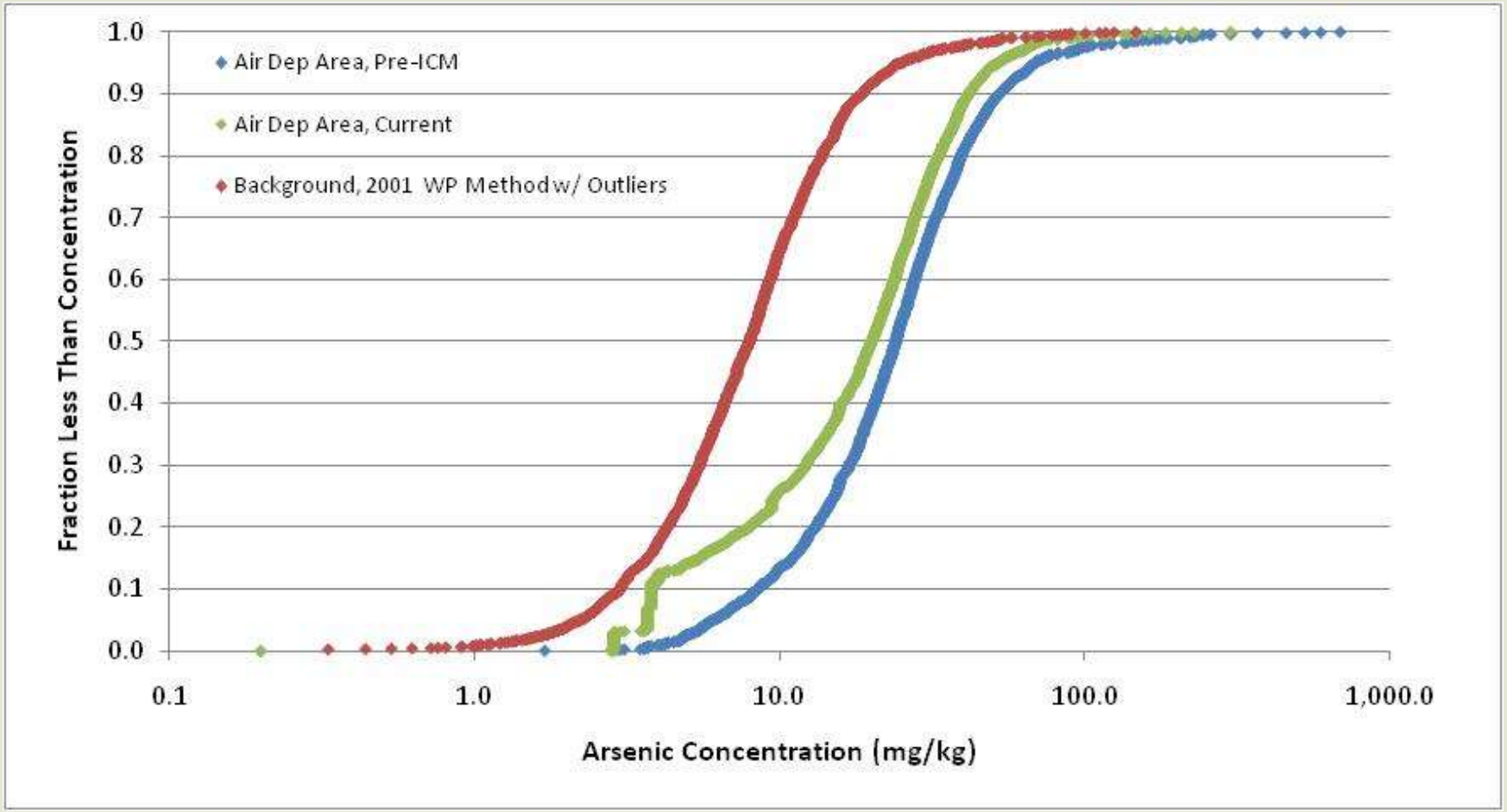
- Based on historical records and sample data, 52 to 155 potential COCs were identified in each study area
- For chemicals that exceed screening levels, detection frequency and patterns are examined to determine if they could be present due to historical FMC facility activities
- Arsenic is anticipated to be the only COC

Arsenic

- Soil arsenic concentrations
  - Air deposition area
    - » 285 properties
    - » Range ND–298 ppm
  - Culvert 105 north of the canal
    - » 24 properties
    - » Range ND–432 ppm

- Properties include residential, school, agricultural, undeveloped, commercial/business
- Gasport (approx. 5 miles away) provides regional background arsenic concentration data
  - Combination of land uses and former orchard land
  - Range 2-121 ppm

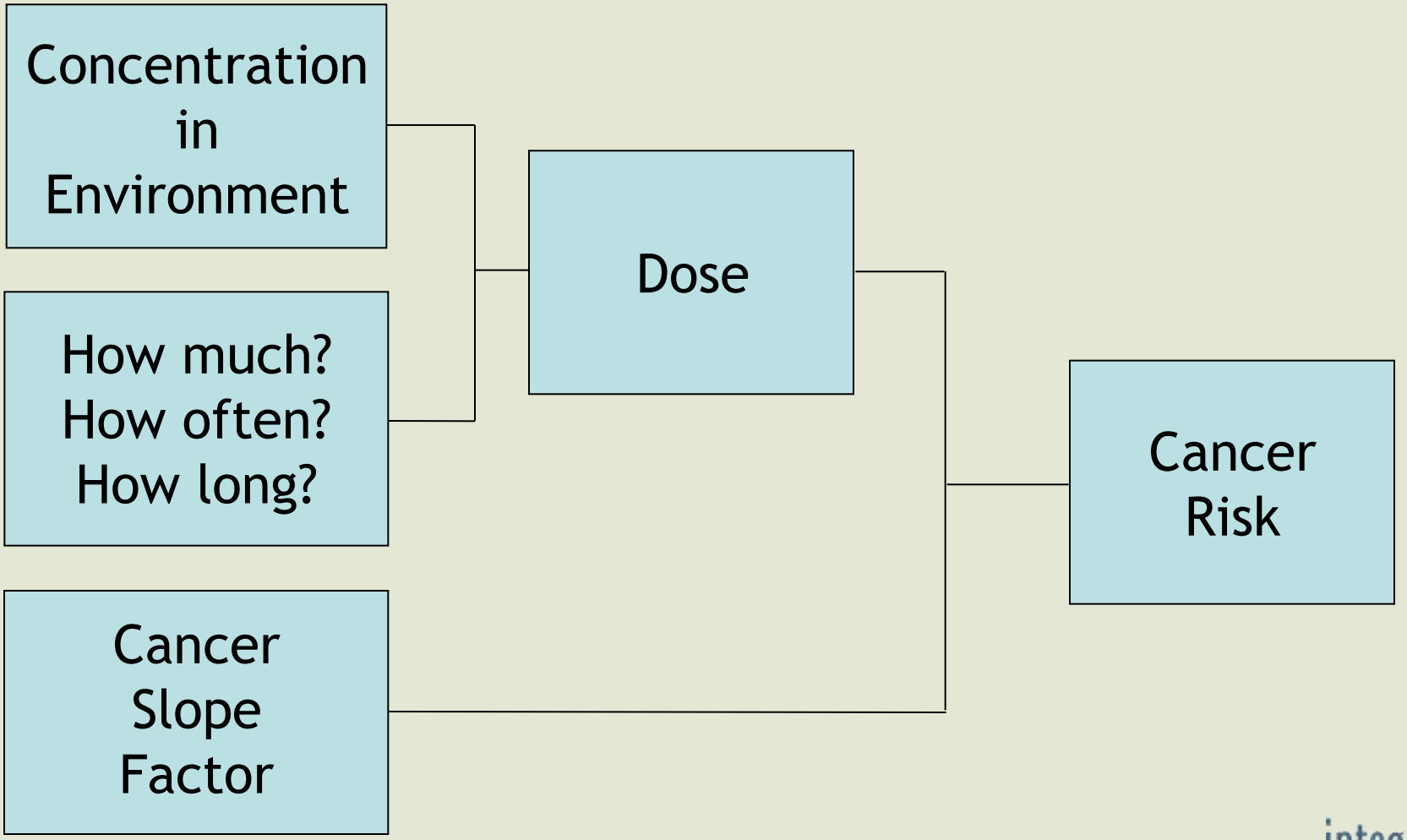
Soil Arsenic Data: Site vs. Background



What Parameters Govern How Much Exposure People Have?

- Soil and dust ingestion rates
- Relative bioavailability of soil arsenic
- Fraction of exposure indoors vs. outdoors
- Exposure duration in years
- Ages when exposed
- Exposure frequency (reduced soil exposure in periods of inclement weather)
- Fraction of skin exposed and amount of soil adhered to skin (for dermal exposures)
- Body weight and length of lifetime

Risks are Estimated by Comparison with Toxicity Values

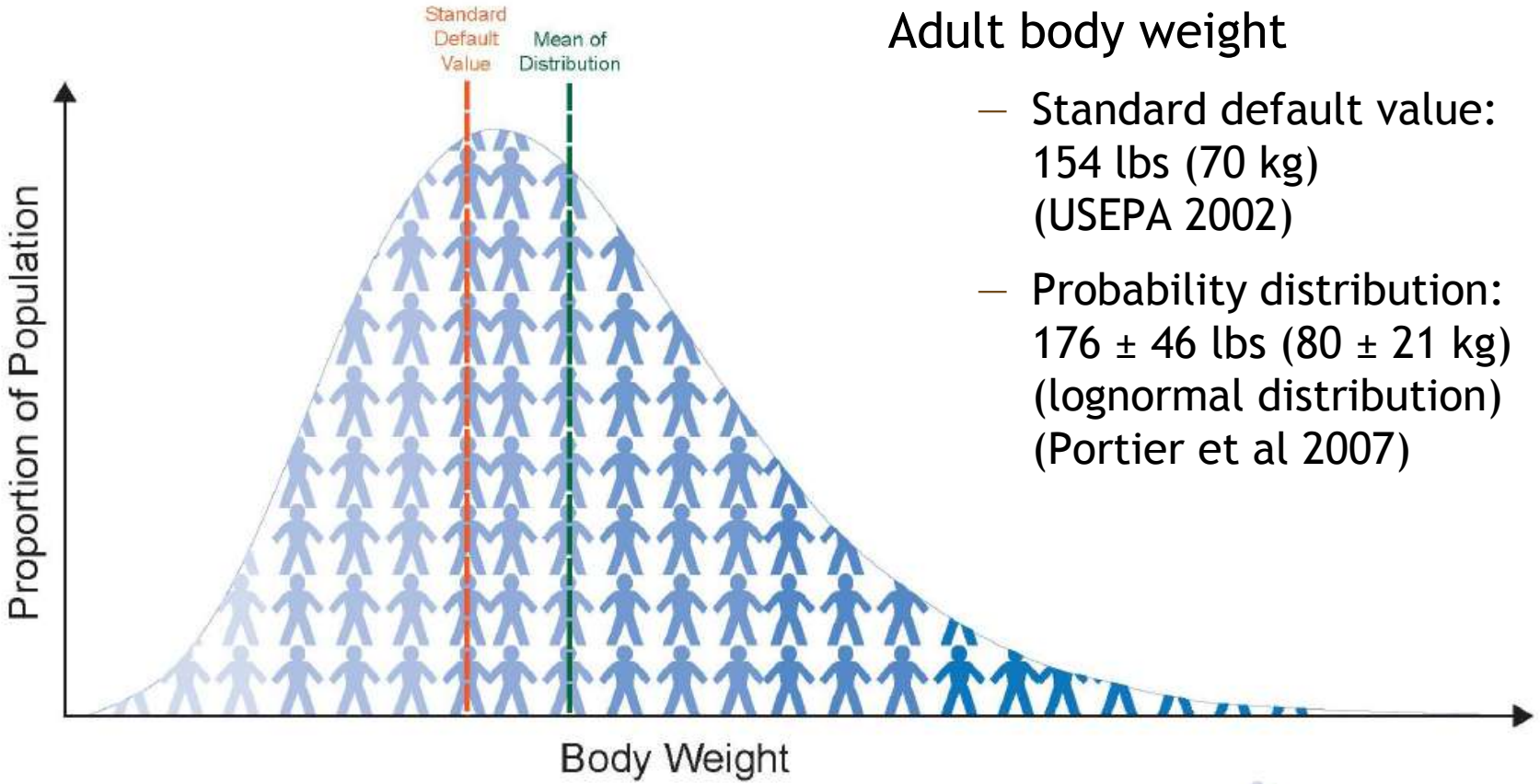


Deterministic vs. Probabilistic Risk Assessment Approaches

- Deterministic risk assessment: point estimates are used as measures of exposure and toxicity in order to calculate a point estimate of risk
  - Central tendency exposure (CTE)
  - Reasonable maximum exposure (RME)

- Probabilistic risk assessment: probability distributions are assigned for one or more exposure parameters to yield an output probability distribution for the risk estimate

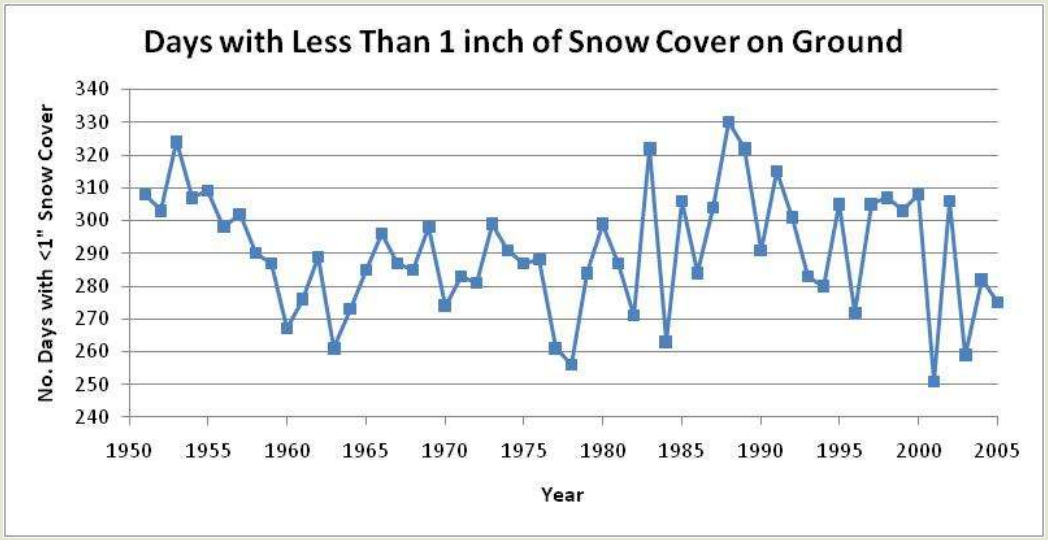
Distributions: Body Weight

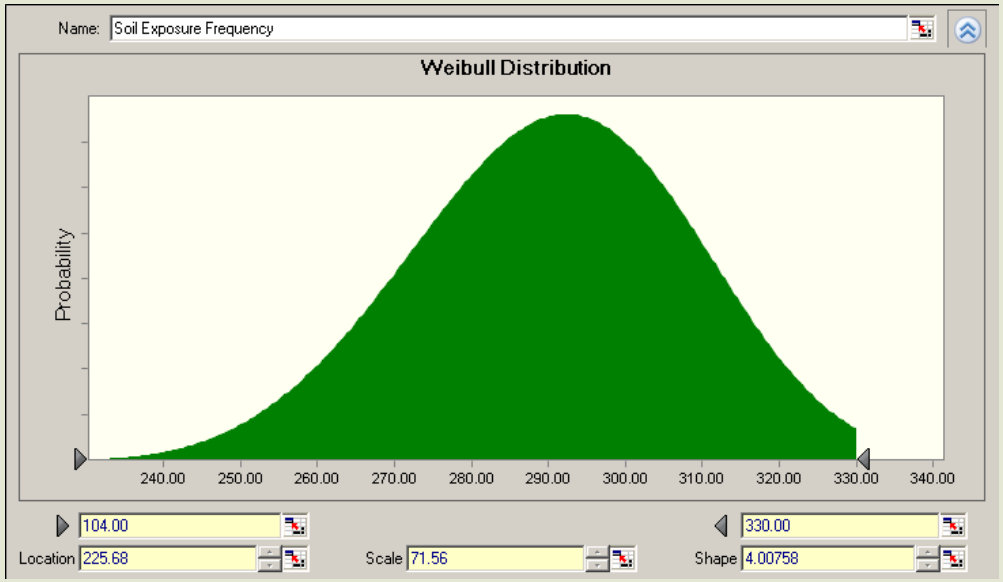


Adult body weight

- Standard default value: 154 lbs (70 kg) (USEPA 2002)
- Probability distribution: 176 ± 46 lbs (80 ± 21 kg) (lognormal distribution) (Portier et al 2007)

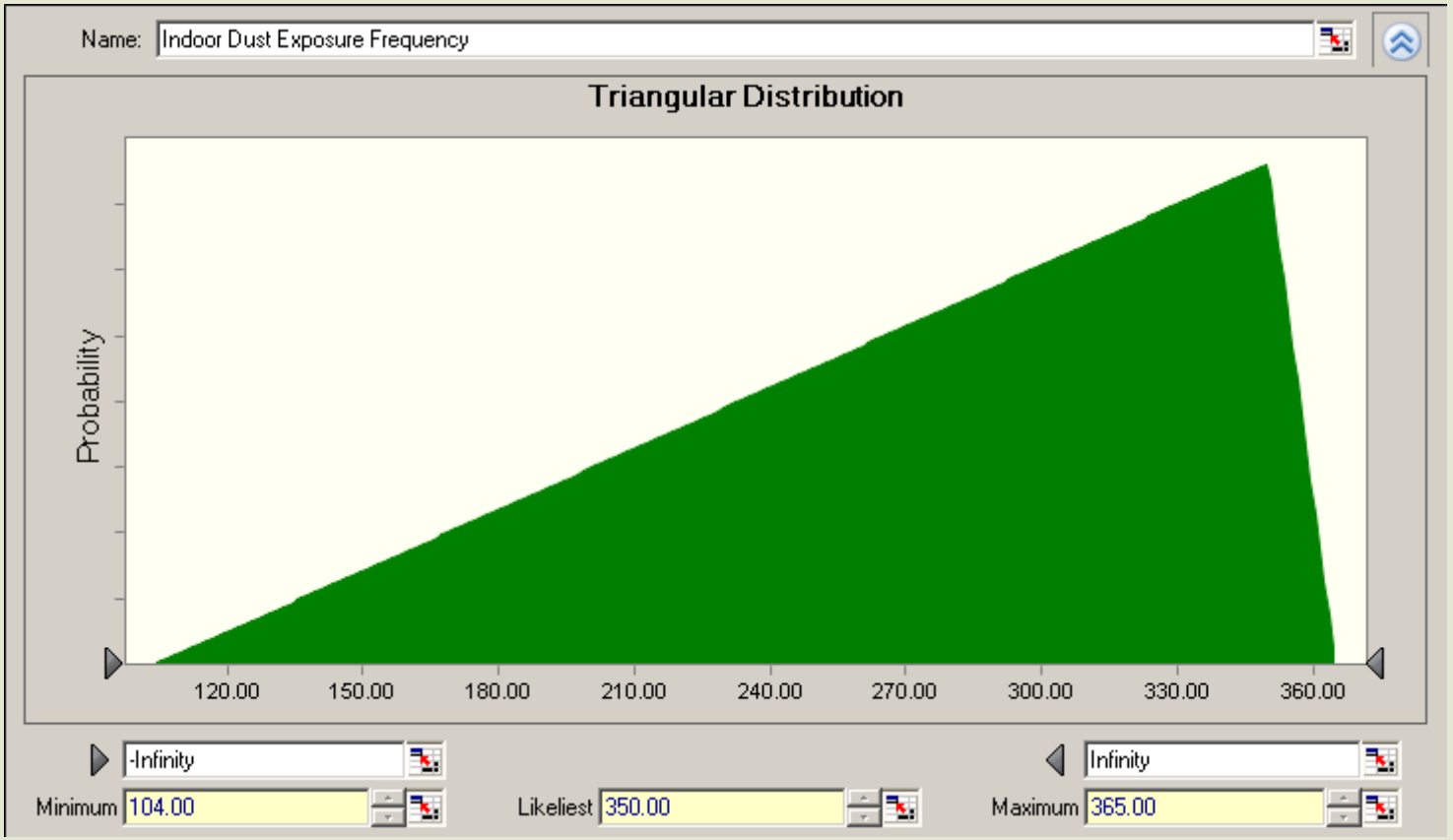
Exposure Factors: Soil Exposure Frequency (default 350 days, site specific mean 291 days)





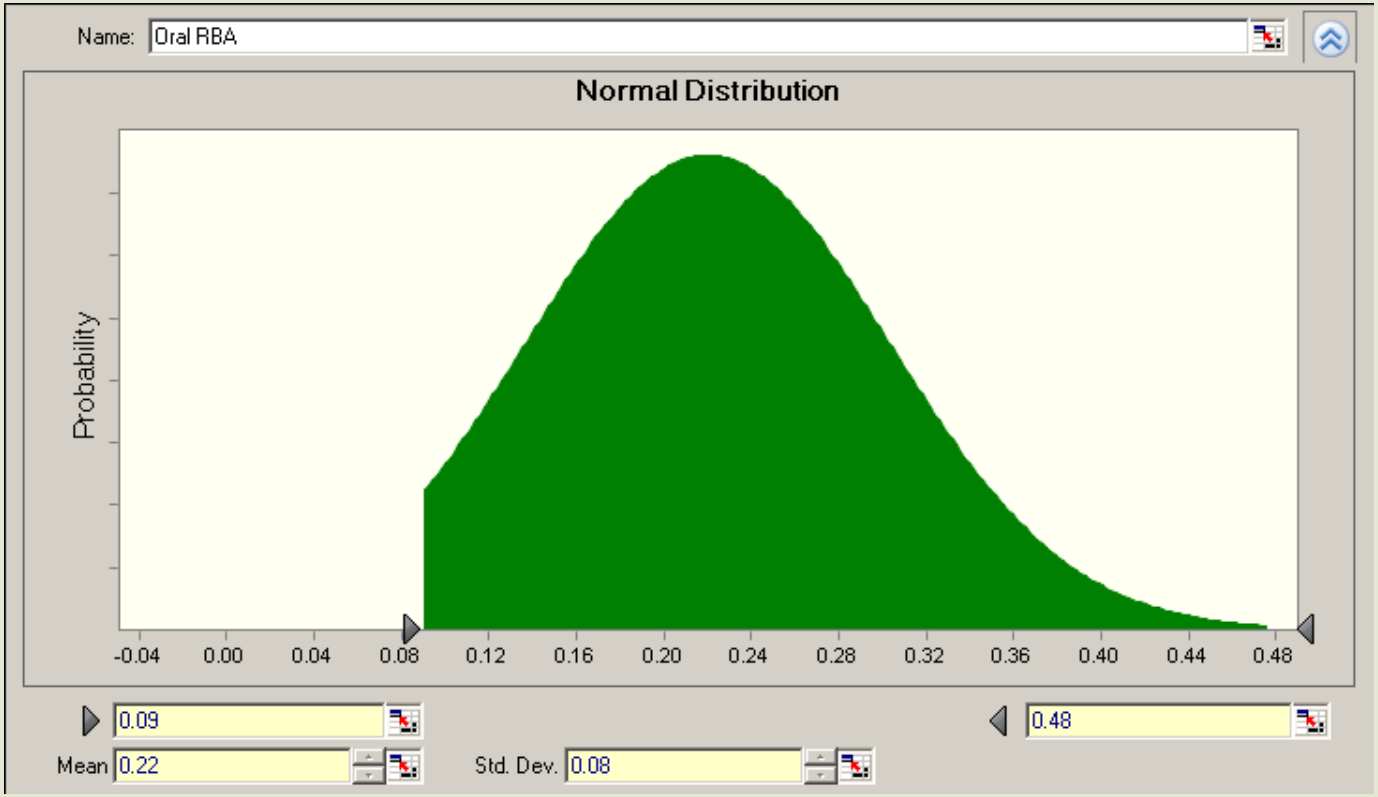
Exposure Factors: Indoor Dust Exposure Frequency (default and site specific 350 days/year)

Parameter	Value
Minimum	104
Likeliest	350
Maximum	365

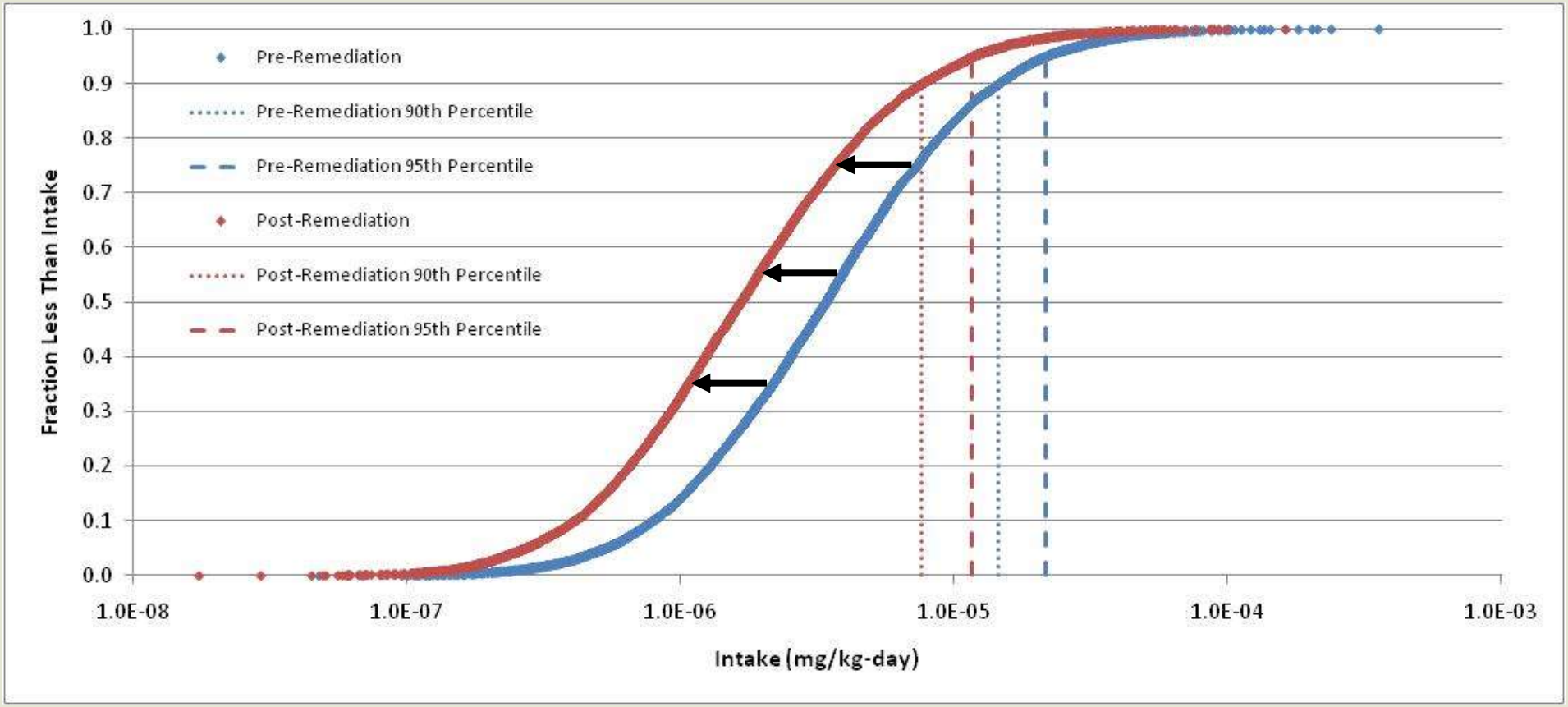


Exposure Factors: Oral Relative Bioavailability (default 1, site specific mean 0.22)

Sample	Dose (mg As/kg bw)	RBA (unitless) Mean	Std. Dev.
NYPF1	0.99	0.19	0.05
NYPF2	0.30	0.28	0.10
NYPF3	0.49	0.20	0.10
Overall		0.22	0.083



Theoretical Example Probabilistic Result: How Intakes Could Change with Remediation



How Probabilistic Risk Assessment is Helpful for the CMS

- Goal: provide a comprehensive HHRA that most effectively utilizes Middleport-specific data and best supports the development of effective CMS alternatives
- Distributions describe variability across an entire community --> more comprehensive characterization of risk
- For the Middleport CMS, the distributions will let us see how remedial alternatives could change exposures across the entire community

Site-Specific Data: We Need your Feedback!

- Any questions for us?
- We have questions for you! Please help us with our on-line survey to improve the risk assessment for you
  - www.middleportny.com/survey