

# Linking Data to Create Information for Public Health Practitioners:

## Fish Contaminants and Consumption Advisories

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National Environmental Public Health Tracking Network Conference  
April 22, 2005

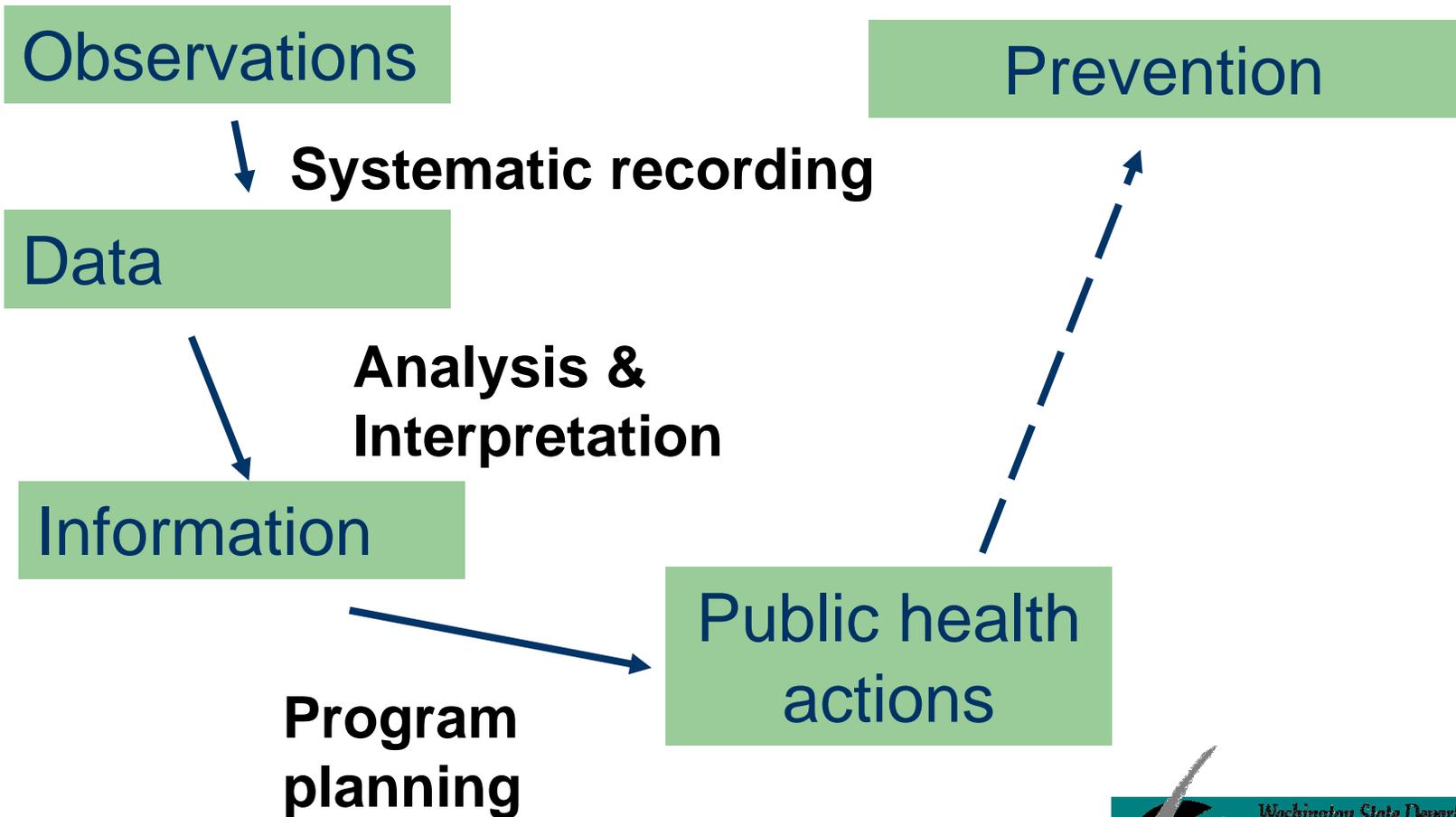
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# Back in the old days

- Informal data sharing
- Many formats
- Spreadsheets usually used for data management and analysis (Please don't sort)
- No documentation or auditing; which version of data used?
- Differences in approaches to generating fish consumption advice
- Inconsistent documentation of technical details

# Data to Practice



# Provide information about healthy consumption of fish

- Fish are healthy food
- Everyone should have the recommended two meals of fish per week
- People need to eat a variety of fish to minimize their exposure to chemicals in fish
  - Specific recommended meal limits
  - Understandable metric  
(none, 1/month, 2/month, 1/week, 2/week, no limit)

This is the information need

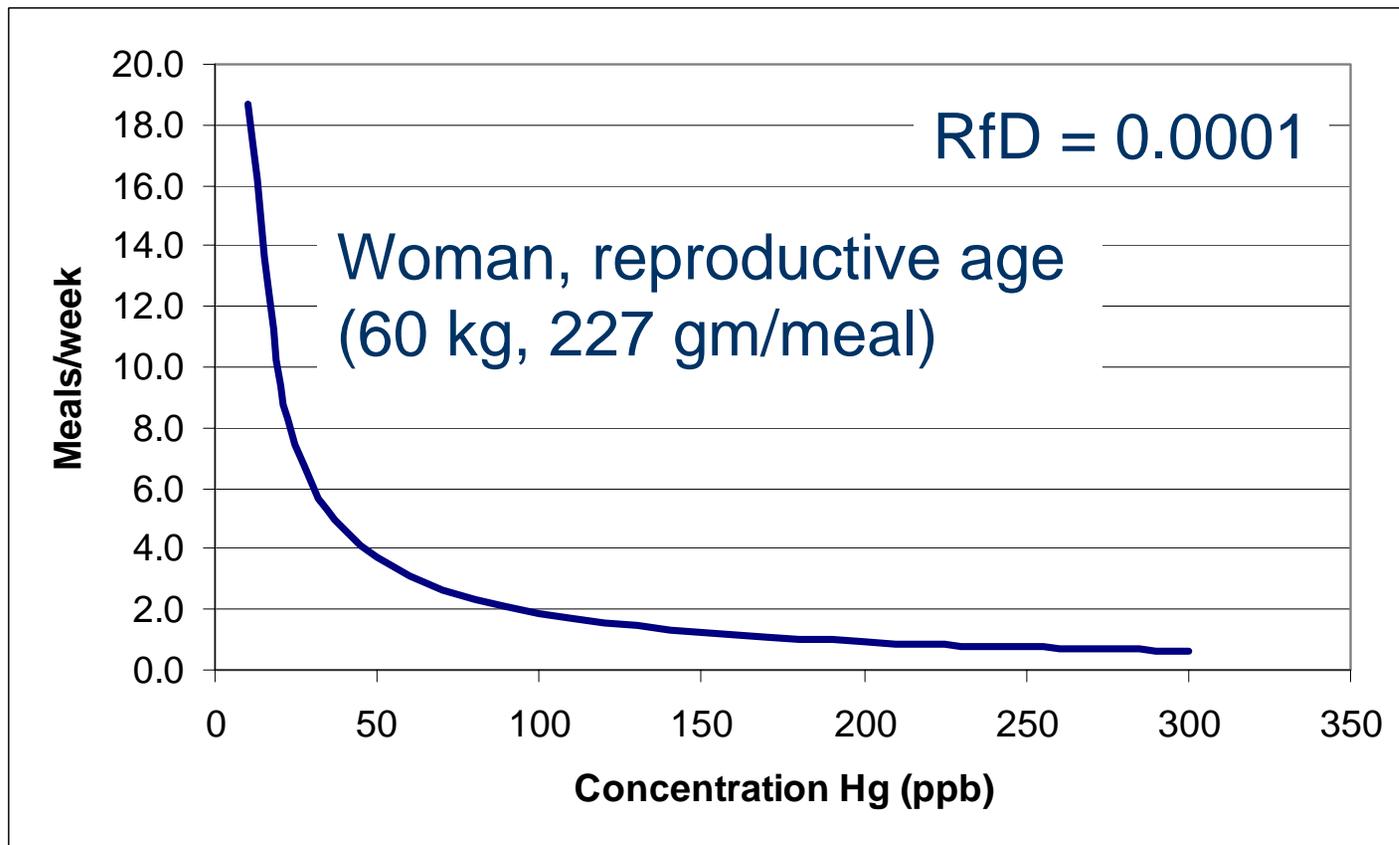
# Information need: meal limits

- Meal Limit =  $\frac{\text{Rfd} * 30.4 * \text{BW}}{\text{meal size} * \text{Conc.}}$
- Meal Limit =  $\frac{\text{Risk Level} * 30.4 * \text{BW}}{\text{CSF} * \text{meal size} * \text{Conc.}}$

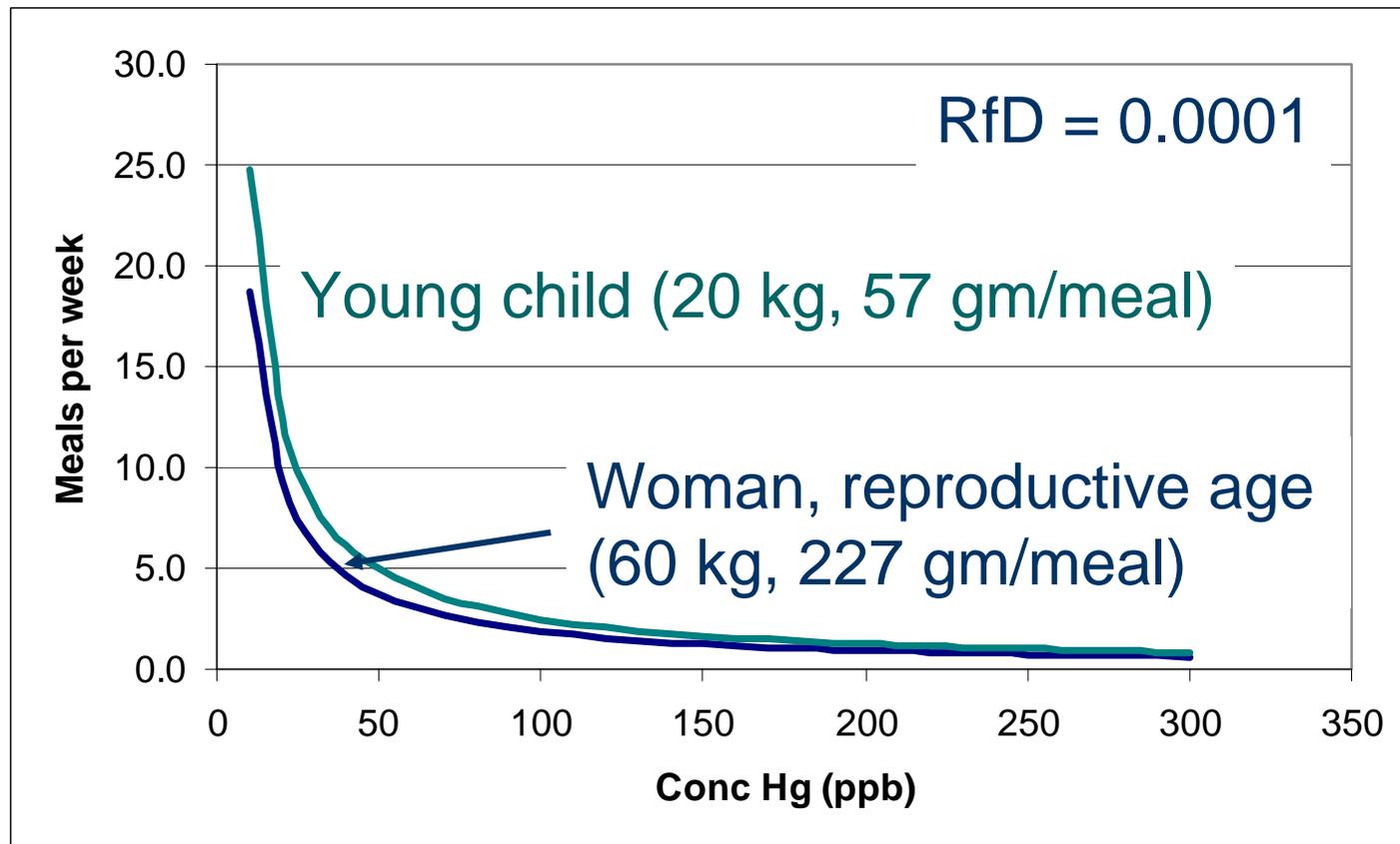
# Information need: meal limits

- Meal Limit =  $\frac{A}{\text{Conc.}}$
- Meal Limit =  $\frac{B}{\text{Conc.}}$

# Recommended meal limit



# Two target populations



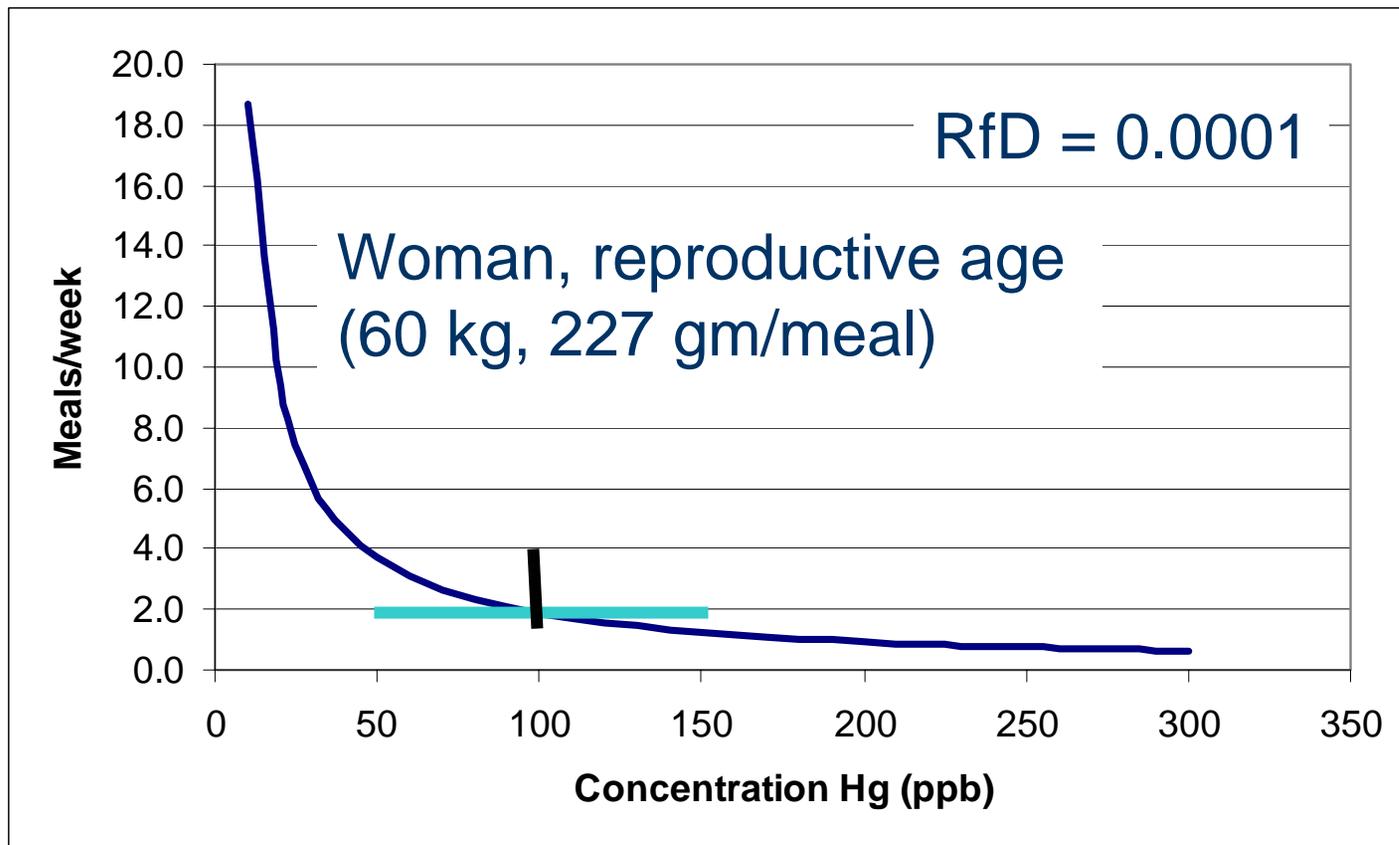
# Make it understandable

- Standard meal limits  
none, 1/month, 2/month, 4/month, 8/month  
no limit
- Round from computed meal limit to standard meal limit
- Cut-points half way between standard meal limits

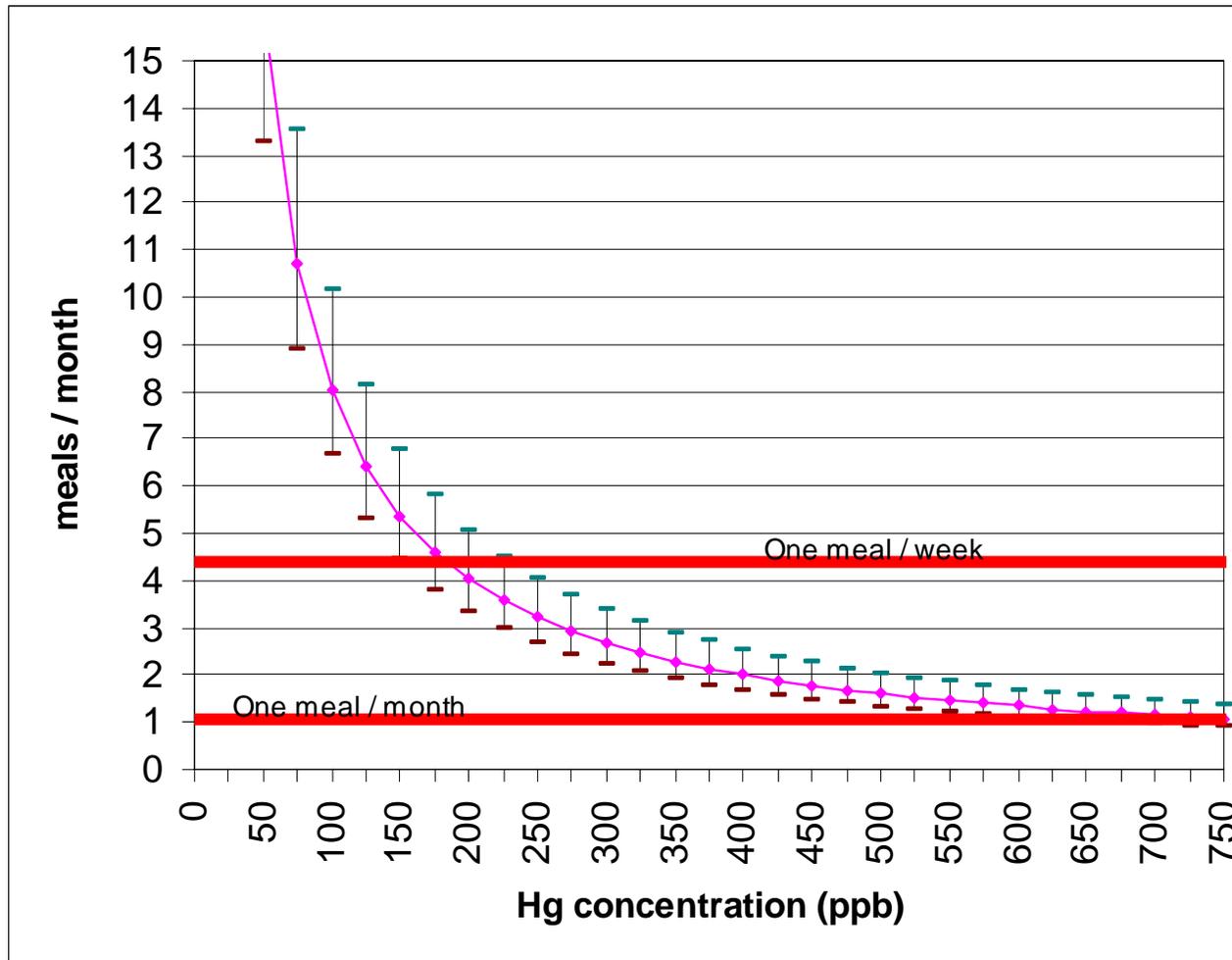
# All we need to know is

- Body weight (assumption)
- Meal size (assumption)
- Rfd, or CSF and risk level
- Mean concentration of contaminant
  
- But..... We don't really know the mean concentration; its just an estimate

# Effect of uncertainty



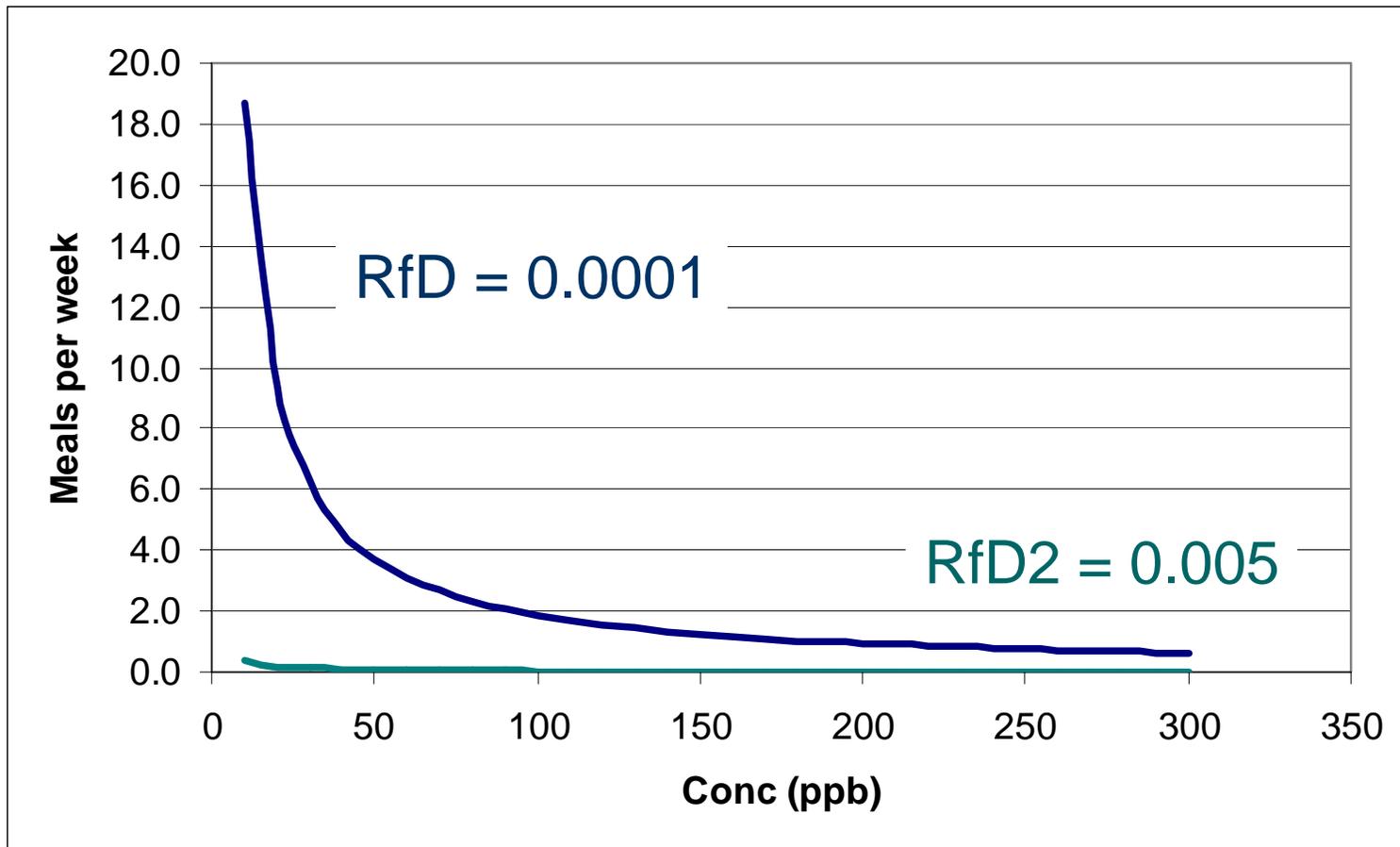
# Decision points and confidence intervals



# All we need to know is

- Mean concentration of contaminant
- Precision of estimate of mean (95% CI)
- Body weight (assumption)
- Meal size (assumption)
- Rfd, or CSF and risk level
  
- But..... There might be several contaminants

# Two contaminants



# All we need to know is

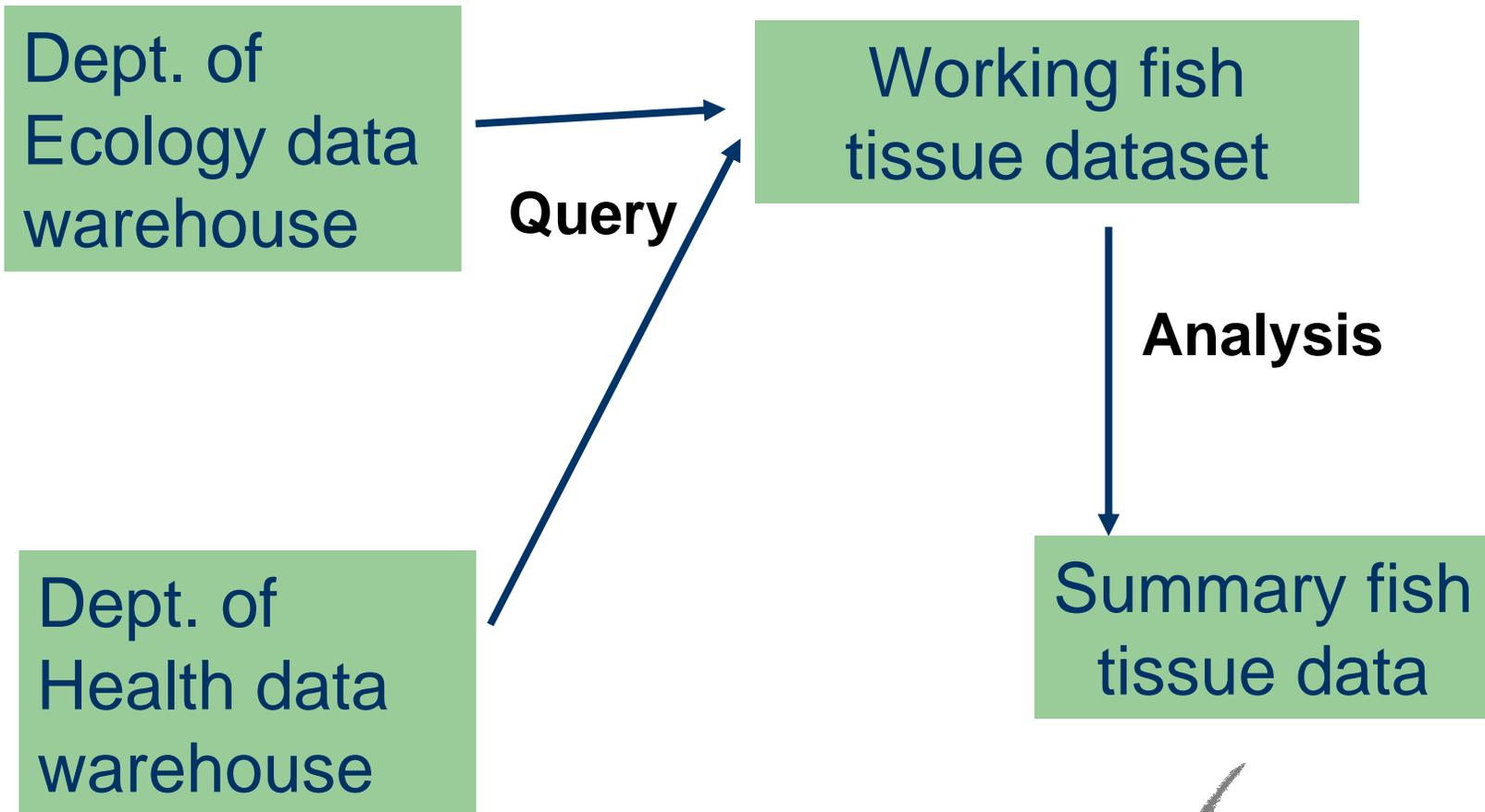
- Body weight (assumption)
- Meal size (assumption)
- Rfd, or CSF and risk level
- Mean concentration of contaminant
- Precision of estimate of mean (95% CI)
- Mean, precision and RfD for all contaminants
  
- But..... Some contaminants have same endpoint

# EIEIO

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- Data acquisition and analysis
- Meal limit analysis
- Document consumption advisories

# 1. Data Acquisition and Analysis



# Dept. of Ecology Environmental Data Warehouse (EIM)

- Washington Department of Ecology's primary repository of environmental data
  - **Approximately 10,000 records of fish tissue data**
- Web access for searches/downloads by project, species, parameter, location (GIS)  
[www.ecy.wa.gov/services/as/iip/eim](http://www.ecy.wa.gov/services/as/iip/eim)
- Exchange Network node

# New EIEIO Analysis Project



Project Name

Project End Date

Project Abstract

Project Description

OK

Cancel

Help

# EIEIO Query Criteria

Date Range

Tuesday , April 19, 2005

Tuesday , April 19, 2005

Study Name

Location

0 - No Location Specified

Taxon

Bridgelip Sucker  
Brown Bullhead  
Brown Trout  
Burbot  
Channel Catfish  
Chinook Salmon  
Chinook Salmon - fall

Analyte

1,2,3,4,6,7,8,9-OCDD  
1,2,3,4,6,7,8,9-OCDF  
1,2,3,4,6,7,8-HpCDD  
1,2,3,4,6,7,8-HpCDF  
1,2,3,4,7,8,9-HpCDF  
1,2,3,4,7,8-HxCDD  
1,2,3,4,7,8-HxCDF

Query

Cancel

Help

- Query Results
- Contaminant Trends in Lake Roosevelt
  - TCDD/TCDF in Lake Roosevelt (Columbia) Sediment and Tissue

**List of Studies from EIM Query**

Project Name	Start Date	End Date	Study Area Description
Contaminant Trends in Lake Roosevelt	1/1/1992	11/1/1994	
TCDD/TCDF in Lake Roosevelt (Columbia) Sediment and Tissue	6/1/1990	6/1/1991	

Selected Studies

**Details**

Data Acquisition

Preliminary Analysis

Analysis Scenarios

Advisory

 New Query

 Complete Data Acquisition

  Query Results

  Contaminant Trends in Lake Roosevelt

  TCDD/TCDF in Lake Roosevelt (Columbia) Sediment and Tissue

# EIEIO Fish Meal Limits Analysis Application

Projects Edit Admin Help Testing

Data Acquisition

Preliminary Analysis

Analysis Scenarios

Advisory

 New Query

 Complete Data Acquisition

 Query Results

 ~ Contaminant Trends in Lake Roosevelt

 + WENATCHEELK3

 - ~ COLUMBIA R. SPM STATION AT NORTHPORT

 Largescale Sucker - *Catostomus macrocheilus*

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 Largescale Sucker - *Catostomus macrocheilus*

 Largescale Sucker - *Catostomus macrocheilus*

 Largescale Sucker - *Catostomus macrocheilus*

 + Deep Creek @ Mouth

 - ~ Columbia R S of Northport

 Largescale Sucker - *Catostomus macrocheilus*

 Largescale Sucker - *Catostomus macrocheilus*

 Largescale Sucker - *Catostomus macrocheilus*

 Largescale Sucker - *Catostomus macrocheilus*

Query Results

- [-] Contaminant Trends in Lake Roosevelt
  - [+] WENATCHEELK3
  - [-] COLUMBIA R. SPM STATION AT NORTHPORT
    - Largescale Sucker - Catostomus macrocheilus
    - Largescale Sucker - Catostomus macrocheilus
  - [+] Deep Creek @ Mouth
  - [-] Columbia R S of Northport
    - Largescale Sucker - Catostomus macrocheilus
    - Largescale Sucker - Catostomus macrocheilus
    - Largescale Sucker - Catostomus macrocheilus
    - Largescale Sucker - Catostomus macrocheilus

Selected Studies

- [-] Contaminant Trends in Lake Roosevelt
  - [+] WENATCHEELK3
  - [+] COLUMBIA R. SPM STATION AT NORTHPORT
  - [-] Deep Creek @ Mouth
    - Largescale Sucker - Catostomus macrocheilus
    - Largescale Sucker - Catostomus macrocheilus
    - Largescale Sucker - Catostomus macrocheilus
  - [+] Columbia R S of Northport
  - [+] Upper L Roosevelt nr Kettle Falls
  - [+] Columbia River at Northport r.m.735.1

**Stations in Contaminant Trends in Lake Roosevelt**

Station ID	Station Name	Station Location Description
75012	WENATCHEELK3	
5031082	COLUMBIA R. SPM STATION AT NORTHPOR	OFF NORTHPORT BOAT LAUNCH
24329170	Deep Creek @ Mouth	Mouth of Deep Creek tributary to Columbia River at r.m.
34661083	Columbia R S of Northport	0.2 miles off left bank, between Northport and Squaw Cr
47918100	Upper L Roosevelt nr Kettle Falls	Upper Lake Roosevelt off Colville River near Kettle Falls
95995836	Columbia River at Northport r.m.735.1	Columbia River at Northport r.m.735.1

**Studies to be Included in this Analysis Project**

Project Name	Start Date	End Date	Study Area Description
Contaminant Trends in Lake Roosevelt	1/1/1992	11/1/1994	

**Analysis Project Data**

- Contaminant Trends in Lake Roosevelt
  - WENATCHEELK3
    - COLUMBIA R. SPM STATION AT NORTHF
      - Largescale Sucker - Catostomus macro
      - Largescale Sucker - Catostomus macro
    - Deep Creek @ Mouth
    - Columbia R S of Northport
    - Upper L Roosevelt nr Kettle Falls
    - Columbia River at Northport r.m.735.1
      - Largescale Sucker - Catostomus macro
      - Largescale Sucker - Catostomus macro
      - Largescale Sucker - Catostomus macro
      - Largescale Sucker - Catostomus macro

**Filtering Tools**

Station Filter: All [Include] [Exclude]

Species Filter: All [Include] [Exclude]

Size Class Filter: All [Include] [Exclude]

Analyte Filter: All [Include] [Exclude]

[Clear Filter] [Run Filters]

**Section List**

Object	Location	Species	SizeClass	Analyte Name	Analyte ID	Result Value	Unit of Measure	Result Qualifier
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Cadmium	7440-43-9	13.8	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Copper	7440-50-8	14.3	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Lead	7439-92-1	1.3	mg/Kg ww	The analyte was positive
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Mercury	7439-97-6	0.165	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Zinc	7440-66-6	48.4	mg/Kg ww	The analyte was positive
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Cadmium	7440-43-9	3.1	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Copper	7440-50-8	12.6	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Lead	7439-92-1	0.45	mg/Kg ww	The analyte was positive
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Mercury	7439-97-6	0.019	mg/Kg ww	The analyte was positive
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Zinc	7440-66-6	51.2	mg/Kg ww	The analyte was positive
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Cadmium	7440-43-9	2.57	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Copper	7440-50-8	12	mg/Kg ww	
	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Lead	7439-92-1	0.61	mg/Kg ww	The analyte was positive

**Analysis Project Data**

- Contaminant Trends in Lake Roosevelt
  - WENATCHEELK3
    - COLUMBIA R. SPM STATION AT NORTHPORT
      - Largescale Sucker - Catostomus macro
      - Largescale Sucker - Catostomus macro
    - Deep Creek @ Mouth
      - Columbia R S of Northport
      - Upper L Roosevelt nr Kettle Falls
      - Columbia River at Northport r.m.735.1
        - Largescale Sucker - Catostomus macro
        - Largescale Sucker - Catostomus macro
        - Largescale Sucker - Catostomus macro
        - Largescale Sucker - Catostomus macro

**Filtering Tools**

Station Filter: All [Include] [Exclude]

Species Filter: All [Include] [Exclude]

Size Class Filter: All [Include] [Exclude]

Analyte Filter: Mercury [Include] [Exclude]

[Clear Filter] [Run Filters]

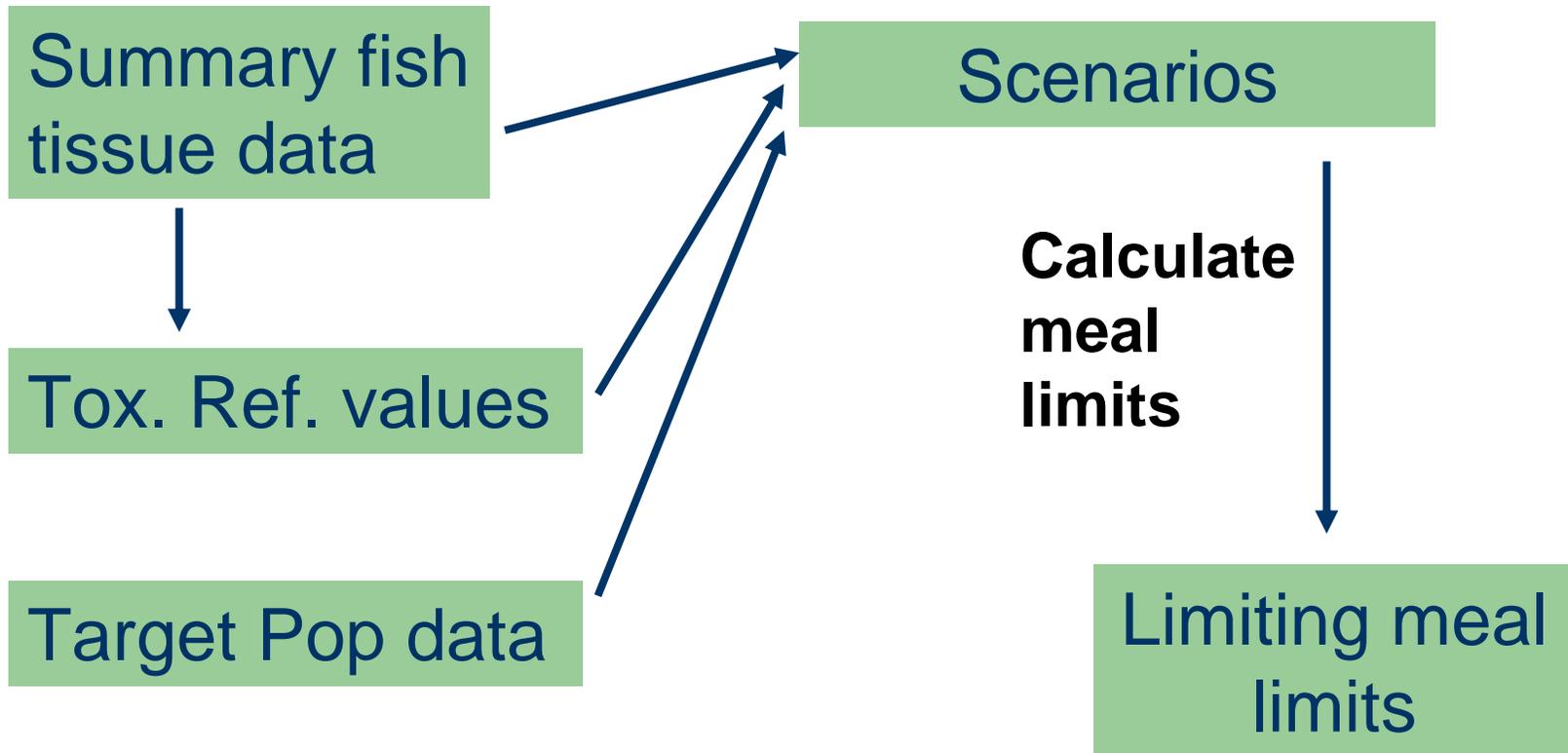
**Section List**

Select	Location	Species	SizeClass	Analyte Name	Analyte ID	Result	Unit of Measu	Result Qualifier
<input checked="" type="checkbox"/>		Largescale Sucker	Large	Mercury	7439-97-6	0.01	mg/Kg ww	The analyte was not d
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.01	mg/Kg ww	The analyte was not d
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.013	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.015	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.017	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.017	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.018	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>	0.2 miles off left bank, between Northport and Squaw Cr	Largescale Sucker	X-Large	Mercury	7439-97-6	0.019	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.02	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.021	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>		Largescale Sucker	X-Large	Mercury	7439-97-6	0.024	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>	OFF NORTHPORT BOAT LAUNCH	Largescale Sucker	X-Large	Mercury	7439-97-6	0.024	mg/Kg ww	The analyte was posit
<input checked="" type="checkbox"/>	OFF NORTHPORT BOAT LAUNCH	Largescale Sucker	X-Large	Mercury	7439-97-6	0.024	mg/Kg ww	The analyte was posit

# Data analysis tools

- Generates descriptive statistics for sub-sets of data
- Weighted statistics based on composite samples
- Computes derived values  
(total PCB congeners, total arochlors etc)
- Options for non-detects (LOD, 1/2 LOD, 0, dist.)
- Adds effects from contaminants with same endpoint

## 2. Meal Limit Analysis

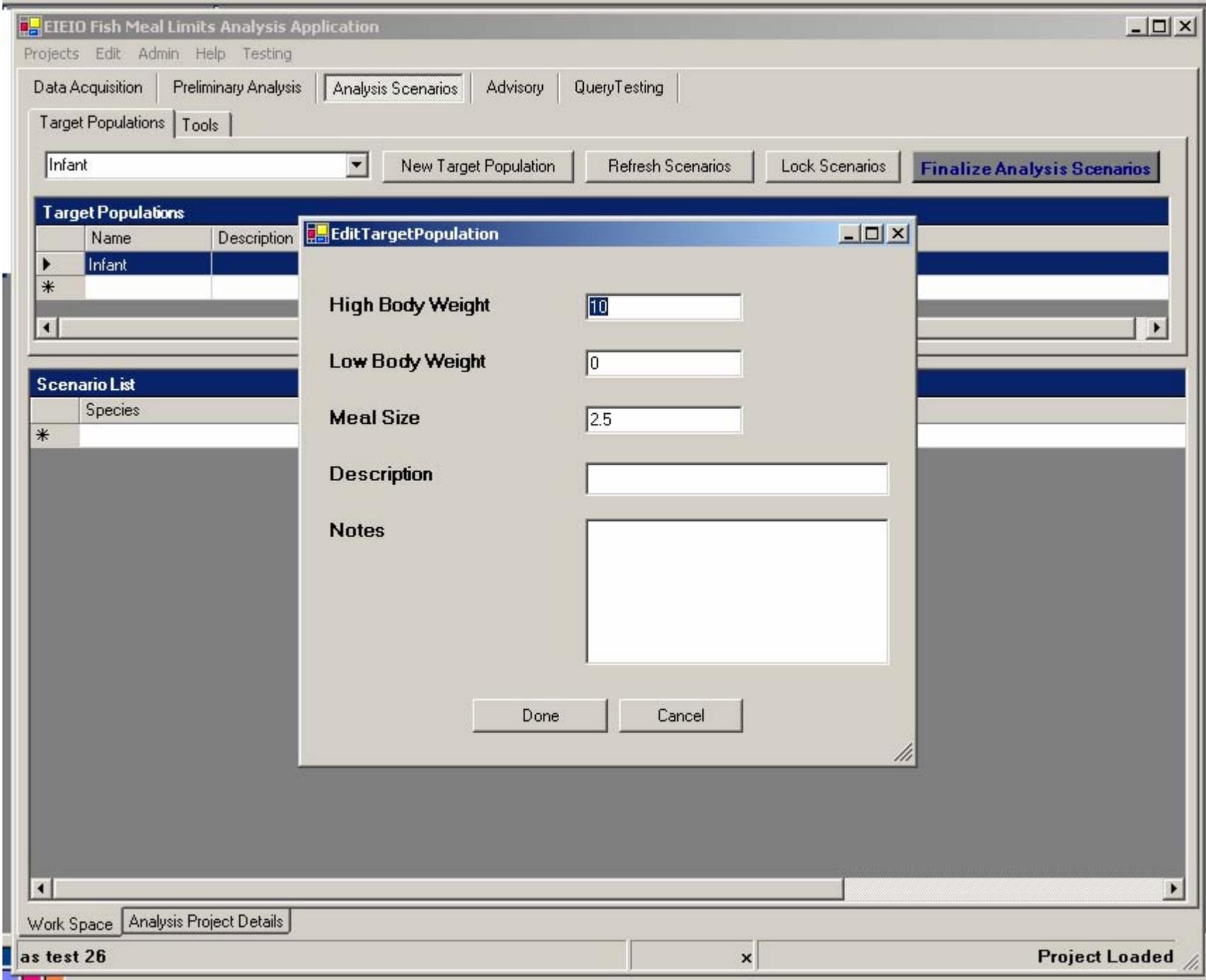


$$\text{Meals/day} = \frac{(\text{body weight}) * (\text{RfD})}{(\text{meal size}) * (\text{Conc.})}$$

Infant [New Target Population] [Refresh Scenarios] [Lock Scenarios] [Finalize Analysis Scenarios]

Target Populations						
	Name	Description	Low Weight	High Weight	Meal Size	Notes
▶			0	10	2.5	
*						

Scenario List					
	Species	SC	Contaminant	TPD	HE
*					



Infant

New Target Population

Refresh Scenarios

Lock Scenarios

Finalize Analysis Scenarios

Target Populations

Name	Description
▶ Infant	
*	

Scenario List

Species
*

**EditTargetPopulation**

High Body Weight

Low Body Weight

Meal Size

Description

Notes

Done Cancel

Infant

New Target Population

Refresh Scenarios

Lock Scenarios

Finalize Analysis Scenarios

Target Populations

	Name	Description	Low Weight	High Weight	Meal Size	Notes
▶	Infant		0	10	2.5	
*						

Scenario List

	Species	SC	Contaminant	TPD	HE
*					

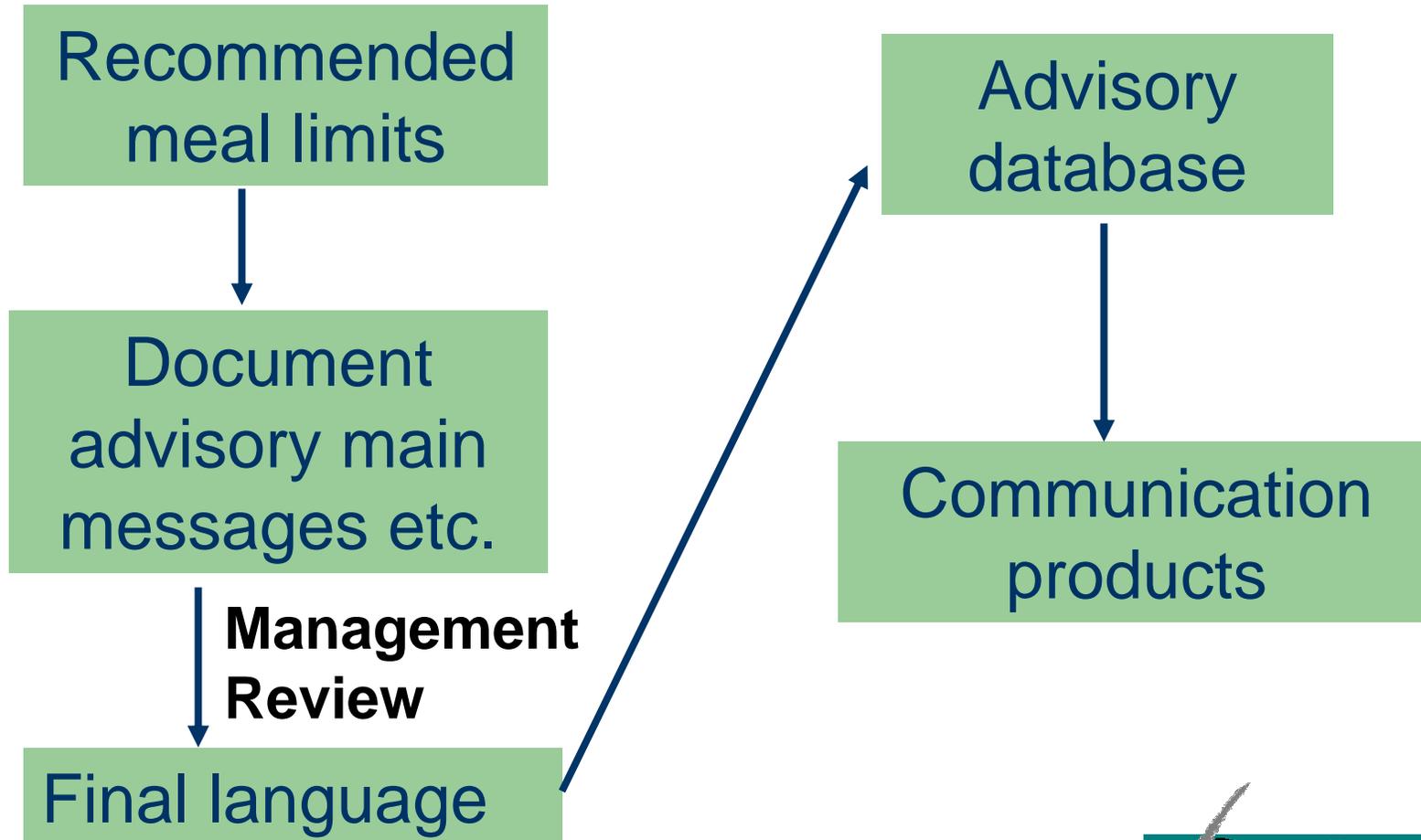
Target Populations						
Name	Description	Low Weight	High Weight	Meal Size	Notes	
Infant	infants 0-2 years	0	10	2.5	sensitivity spike at 1 year	
Children	children 2-10 years	0	15	3.8	sensitivity decreases drastically between 9 and 10 years	
*						

Scenario List									
Species	SC	Contaminant	TPD	HE	CML	SM	CO	LCLM	
Oncorhynchus mykiss	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	
Oncorhynchus mykiss	None	Aldrin	infants 0-2 years	Cancer 1E-4	0.012845070	0	n/a	0.012346013	
Oncorhynchus mykiss	None	Aldrin	infants 0-2 years	Cancer 1E-5	128.4507042	unlimited	12.0	123.4601326	
Oncorhynchus mykiss	None	Aldrin	infants 0-2 years	Cancer 1E-6	1284.507040	unlimited	12.0	1234.601325	
Micropterus salmoides	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	
Micropterus salmoides	None	Aldrin	infants 0-2 years	Cancer 1E-4	0.012833773	0	n/a	0.012446638	
Micropterus salmoides	None	Aldrin	infants 0-2 years	Cancer 1E-5	128.3377308	unlimited	12.0	124.4663853	
Micropterus salmoides	None	Aldrin	infants 0-2 years	Cancer 1E-6	1283.377307	unlimited	12.0	1244.663852	
Salmo trutta	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	
Salmo trutta	None	Aldrin	infants 0-2 years	Cancer 1E-4	0.012408163	0	n/a	0.012006319	
Salmo trutta	None	Aldrin	infants 0-2 years	Cancer 1E-5	124.0816326	unlimited	12.0	120.0631911	
Salmo trutta	None	Aldrin	infants 0-2 years	Cancer 1E-6	1240.816325	unlimited	12.0	1200.631910	
Ictalurus punctatus	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	
Ictalurus punctatus	None	Aldrin	infants 0-2 years	Cancer 1E-4	0.017708737	0	n/a	0.011630632	
Ictalurus punctatus	None	Aldrin	infants 0-2 years	Cancer 1E-5	177.0873786	unlimited	12.0	116.3063264	
Ictalurus punctatus	None	Aldrin	infants 0-2 years	Cancer 1E-6	1770.873784	unlimited	12.0	1163.063263	
Stizostedion vitreum	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	
Stizostedion vitreum	None	Aldrin	infants 0-2 years	Cancer 1E-4	0.012471794	0	n/a	0.012086938	
Stizostedion vitreum	None	Aldrin	infants 0-2 years	Cancer 1E-5	124.7179487	unlimited	12.0	120.8693809	
Stizostedion vitreum	None	Aldrin	infants 0-2 years	Cancer 1E-6	1247.179485	unlimited	12.0	1208.693808	
Perca flavescens	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	
Perca flavescens	None	Aldrin	infants 0-2 years	Cancer 1E-4	0.013217391	0	n/a	0.005006587	
Perca flavescens	None	Aldrin	infants 0-2 years	Cancer 1E-5	132.1739130	unlimited	12.0	50.06587615	
Perca flavescens	None	Aldrin	infants 0-2 years	Cancer 1E-6	1321.739129	unlimited	12.0	500.6587610	
Coregonus clupeaformis	None	Aldrin	infants 0-2 years	hepatotoxicity	0	0	n/a	0	

# Analysis tools

- Add target populations
- Edit assumed values for body weight and meal size
- Access summary data from consumption studies
- Access and link to toxicological reference values
- Calculate meal rate based on hazard quotient

# 3. Issue Consumption Advisory



# EIEIO Phase II (and III)

- GIS front end and mapping advisories, target populations (built-in)
- Mapping birth defect data
- Demographic/geographic linkage
- Consumption database
- Risk assessment module

# Use by other states???

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- Not proprietary
- Based on .net
- Data access from Exchange network node
- Could it work for others?

