WATER QUALITY STANDARDS PUBLIC MEETING
HUMAN HEALTH CRITERIA

MAY 14, 2019

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WATER QUALITY STANDARDS PUBLIC MEETING
AGENDA

- Review of 2019 Water Quality Standards Triennial Review
- Timeline for 2020 proposal of Human Health Criteria
- Go over 2015 Human Health Criteria as proposed by EPA
- Go over West Virginia's 2008 fish consumption study
- Discussion and Questions

Agenda uploaded on 5/1/19 to
https://dep.wv.gov/WWE/Programs/wqs/Pages/WQSpublicmeetings.aspx

REVIEW OF TRIENNIAL REVIEW
SUBMITTAL OF AGENCY-APPROVED RULE

2018

March – Held WQS Public Meeting: discussed potential criteria revisions

May – Proposed Public Notice version of Human Health Criteria
Used 2015 EPA-recommended criteria

July – Submitted Agency-Approved rule for Legislative review
Based on public comments, revised criteria to include WV Fish Consumption rate

November – Legislative Rule-Making Review Committee amended rule
Removed criteria revisions, asked DEP to conduct further public participation

REVIEW OF TRIENNIAL REVIEW
LEGISLATIVE REVIEW

2019

January – Held Public Meeting to discuss the potential criteria revisions

March – Legislature passed rule without revisions to human health criteria
Amended rule to include specific requirements for DEP to propose updates in 2020

April – Submitted Final File of rule to Secretary of State

May – Holding this public meeting to further discuss potential criteria revisions

August or September – Hold additional WQS public meeting

By October 1st – DEP will receive any submissions of proposed human health criteria

November – Hold Public Meeting to hear presentations of any submittals proposed

MANDATE FROM WV LEGISLATURE TO PROPOSE IN 2020

Added Subsection 8.6. to 47CSR2:

On or before April 1, 2020, the Secretary shall propose updates to the numeric human health criteria found in Appendix E., subsection 8.23 Organics and subsection 8.25 Phenolic Materials to be presented to the 2021 Legislative Session. The Secretary shall allow for submission of proposed human health criteria until October 1, 2019, and for public comment and agency review for an appropriate time thereafter.

PROPOSAL OF HUMAN HEALTH CRITERIA
TIMELINE

2020

March – Will hold WQS Public Meeting to discuss potential criteria revisions

By April 1st – DEP will propose for public comment updates to numeric human health criteria

July – Following public comment and hearing, will submit Agency-Approved rule for Legislative review

Fall 2020 – Rule will be reviewed by Legislative Rule-Making Review Committee

2021

2021 Legislative Session – Legislature will review proposed rule

HUMAN HEALTH CRITERIA
EPA-RECOMMENDED CRITERIA

What are human health criteria?

Human health ambient water quality criteria represent specific levels of chemicals or conditions in a water body that are not expected to cause adverse effects to human health.

Lifetime of Exposure

Human Health Criteria developed and recommended by USEPA, are designed to protect people
for a 70-year duration, or a potential lifetime of exposure

Tamarack's Pan Seared West Virginia Mountain Trout

2015 FEDERALLY-RECOMMENDED HUMAN HEALTH CRITERIA

Changes made from the 2002 recommended calculations

Body Weight increased	From 70 kg to 80 kg *(from 154 to 176 lbs)*
Fish consumption rate increased	From 17.5 to 22 grams per day *(90th percentile)*
Water intake rate increased	From 2.0 to 2.4 liters per day
Bioaccumulation factors were used	Instead of bioconcentration factors
Toxicity values were updated	Based on newest available science
Relative Source Contribution (RSC) used	Chemical-specific RSC, from 20-80%

HUMAN HEALTH CRITERIA IN WEST VIRGINIA

WV Use Categories for Human Health

Category C – Water Contact Recreation, protects against consumption of fish

Category A – Water Supply, Public, protects against drinking water and consumption of fish

WEST VIRGINIA'S HUMAN HEALTH CRITERIA CATEGORY C AND CATEGORY A

APPENDIX E, TABLE 1

PARAMETER	USE DESIGNATION						
	AQUATIC LIFE				HUMAN HEALTH		ALL OTHER USES
	B1, B4		B2				
	ACUTE[1]	CHRON[2]	ACUTE[1]	CHRON[2]	C[3]	A[4]	
8.23 Organics							
Acenaphthene (ug/l)					990	670	
Acrylonitrile[b] (ug/l)					0. 66	0.059	
Aldrin[b] (ng/l)	3.0		3.0		0.071	0.071	0.071

Now in nifty alphabetical order!

HUMAN HEALTH CRITERIA IN WEST VIRGINIA

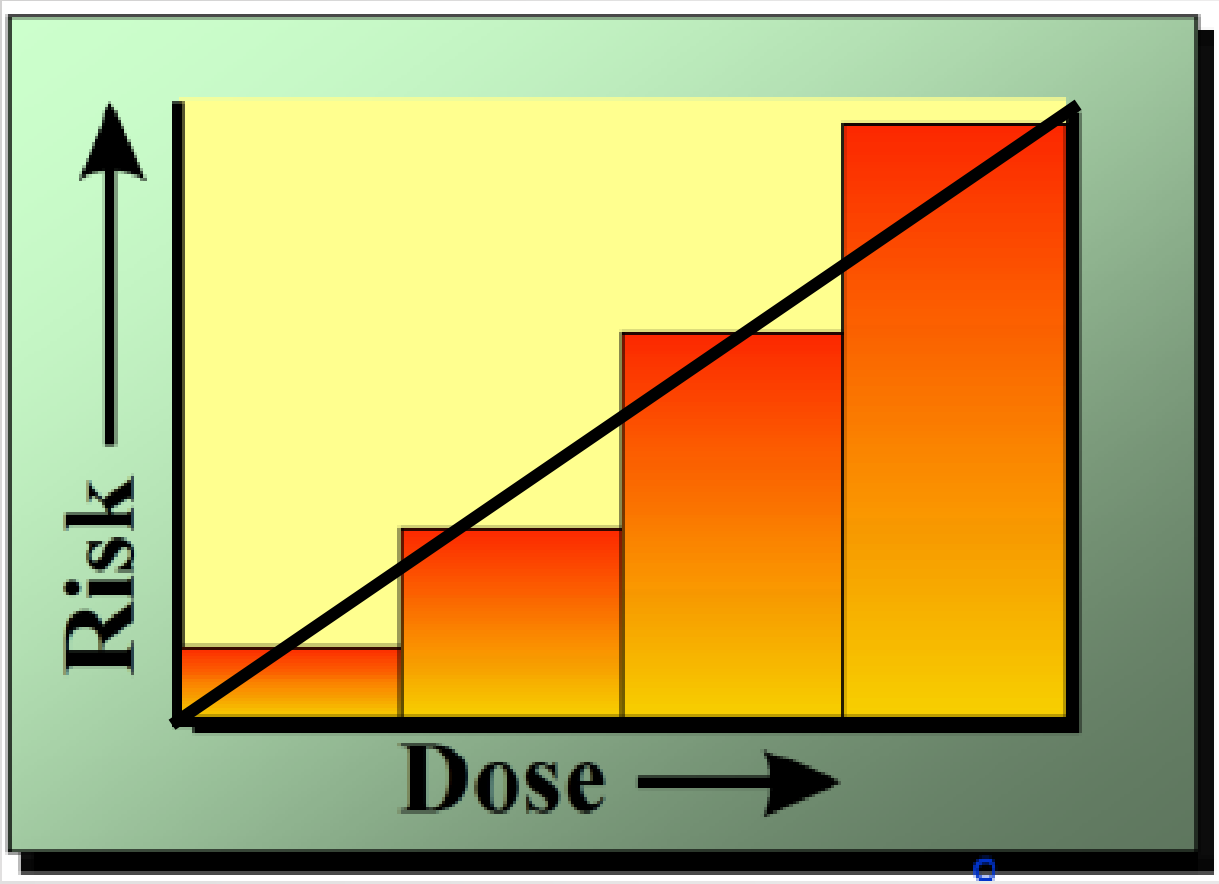
WV Risk Factor for Carcinogens

As stated in 47CSR2 Section 8.2.a.,

carcinogenic toxicants are "*based upon an estimated risk level of one additional cancer case per one million persons*,"

or a 1 in a 1,000,000 (10^{-6}) risk level

(for example, VA uses 1 in 100,000 or 10^{-5})

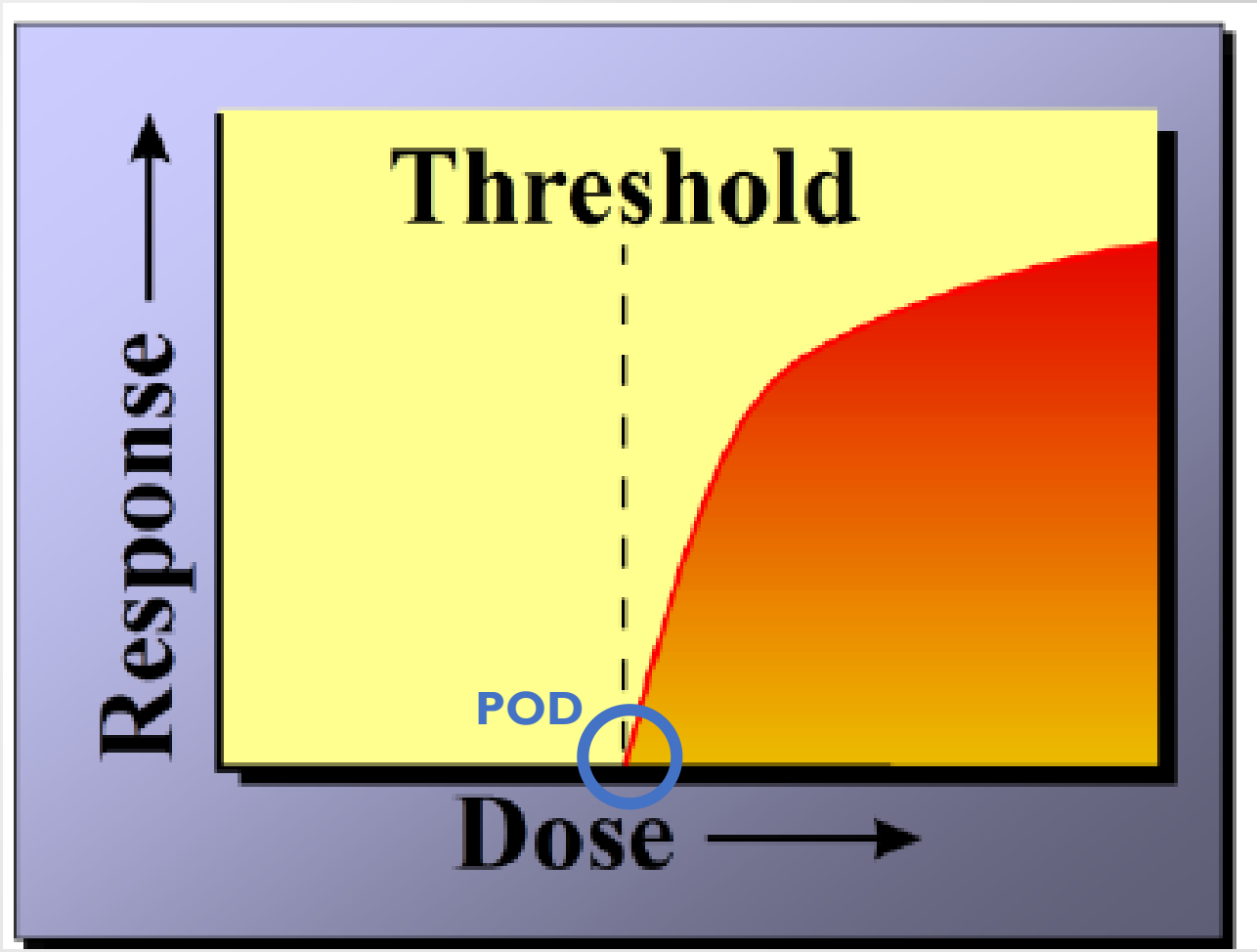


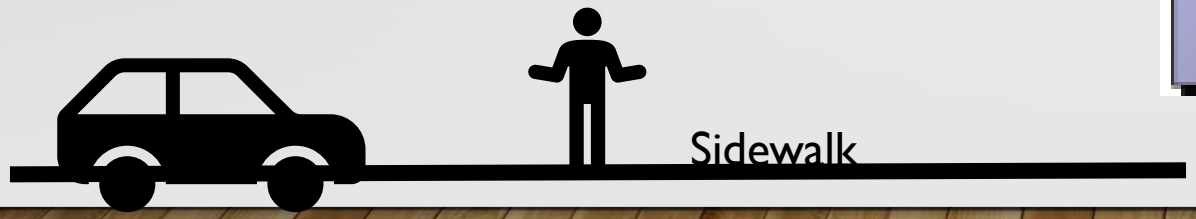
LINEAR OR NON-THRESHOLD EFFECTS

- Any exposure poses some risk of effect
- Traditionally all cancer effects were thought to be linear
- No Point of Departure (POD)

NONLINEAR OR THRESHOLD EFFECTS

- No risk of effect at low exposure
- Now known that some cancer effects are nonlinear
- Have a distinct Point of Departure (POD)





EQUATION FOR CALCULATION CONSUMPTION OF WATER & FISH

$$AWQC\ (\mu g/L) = \frac{\text{toxicity value (mg/kg-d)} \times BW\ (kg) \times 1{,}000\ (\mu g/mg)^{b}}{DI\ (L/d) + \sum_{i=2}^{4} (FCR_i\ (kg/d) \times BAF_i\ (L/kg))}$$

AWQC	= ambient water quality criteria
toxicity value	= **RfD** x **RSC** (mg/kg-d) for noncarcinogenic effects *(**RfD** is reference dose; **RSC** is relative source contribution for noncancer, nonlinear effects)*
	or 10^{-6}/**CSF** (kg-d/mg) for carcinogenic effects *(**CSF** is Cancer Slope Factor)*
BW	= body weight
DI	= drinking water intake
$\sum_{i=2}^{4}$	= total of values for aquatic trophic levels (TLs), letter i is # of TLs
FCR_i	= fish consumption rate for aquatic Trophic Levels 2, 3, and 4
BAF_i	= bioaccumulation factor for aquatic TLs 2, 3, and 4

EQUATION FOR CALCULATION TOXICITY VALUE

$$AWQC\ (\mu g/L) = \frac{\text{toxicity value (mg/kg-d)} \times BW\ (kg) \times 1{,}000\ (\mu g/mg)^{b}}{DI\ (L/d) + \sum_{i=2}^{4} (FCR_i\ (kg/d) \times BAF_i\ (L/kg))}$$

toxicity value	= **RfD** x **RSC** (mg/kg-d) for noncarcinogenic effects *(**RfD** is reference dose;* ***RSC** is relative source contribution for noncancer, nonlinear effects)*
	or 10^{-6}/**CSF** (kg-d/mg) for carcinogenic effects *(**CSF** is Cancer Slope Factor)*

RfD, or Reference Dose

- An estimate of a daily oral exposure that is unlikely to have a risk of effects over a lifetime
- Typically comes from a lab animal study

RSC or Relative Source Contribution

- A portion of RfD attributable to exposure from water as opposed to exposure from air, food or other pathways

EQUATION FOR CALCULATION FISH CONSUMPTION RATE

$$AWQC\ (\mu g/L) = \frac{\text{toxicity value (mg/kg-d)} \times BW\ (kg) \times 1{,}000\ (\mu g/mg)^b}{DI\ (L/d) + \sum_{i=2}^{4} (FCR_i\ (kg/d) \times BAF_i\ (L/kg))}$$

$\sum_{i=2}^{4}$	= total of values for aquatic trophic levels (TLs), letter i is # of TLs
FCR_i	= fish consumption rate for aquatic Trophic Levels 2, 3, and 4

Trophic Level 2	Trophic Level 3	Trophic Level 4
Herbivores, or "primary consumers"	Carnivores that consume herbivores	Carnivores that consume other carnivores

EPA-RECOMMENDED FISH CONSUMPTION RATE

- From NHANES 2014 "Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations
- Collected 2 days of dietary data (24-hour recall) from participants, 1 day in person, 2nd day by phone interview
- Surveys 5,000 people yearly from 15 counties across the country
- Puts West Virginia in "Inland South" category (ie, a non-coastal region) for region-specific considerations

EPA nat'l avg: 22 grams of fish per day

22 grams is the same as ¾ ounces

¾ ounces per day equates to about an **8 oz serving of fish every week and a half**

EPA-RECOMMENDED TROPHIC LEVEL DIVISIONS

Fish *(examples of a few)*	Trophic Level 2 Herbivores, or "primary consumers"	Trophic Level 3 Carnivores that consume herbivores	Trophic Level 4 Carnivores that consume other carnivores
Catfish		0.5	0.5
Tilapia	1		
Trout		1	

	of total 22 g/day
Trophic Level 2	7.6 g/day
Trophic Level 3	8.6 g/day
Trophic Level 4	5.1 g/day

EQUATION FOR CALCULATION BIOACCUMULATION FACTOR

$$AWQC\ (\mu g/L) = \frac{\text{toxicity value (mg/kg-d)} \times BW\ (kg) \times 1{,}000\ (\mu g/mg)^{b}}{DI\ (L/d) + \sum_{i=2}^{4} (FCR_i\ (kg/d) \times BAF_i\ (L/kg))}$$

BCFs

Used to be based on Bioconcentration Factors (BCFs)

BCF: exposure of fish to contaminants in the water column

BAFs

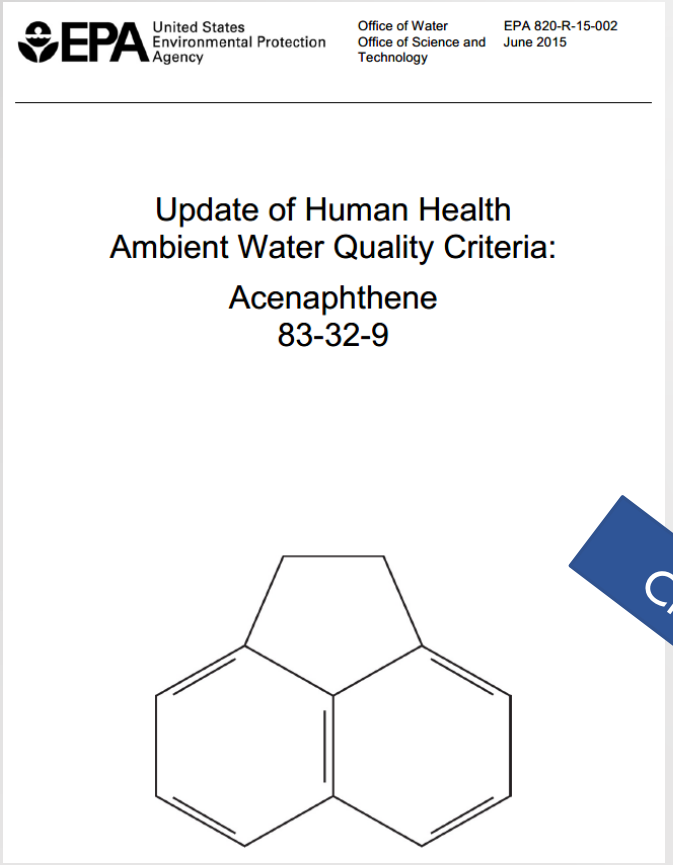
Now based on Bioaccumulation Factors (BAFs) instead of BCFs

BAF: exposure through food chain & accumulation in fish tissue

Accuracy

BAFs provide a more accurate assessment of human exposure to the fish we eat.

SPECIFIC CRITERIA DOCUMENTS
NAT'L RECOMMENDED WQC HHC TABLE


EPA United States Environmental Protection Agency | Office of Water, Office of Science and Technology | EPA 820-R-15-002, June 2015

Update of Human Health Ambient Water Quality Criteria:

Acenaphthene
83-32-9

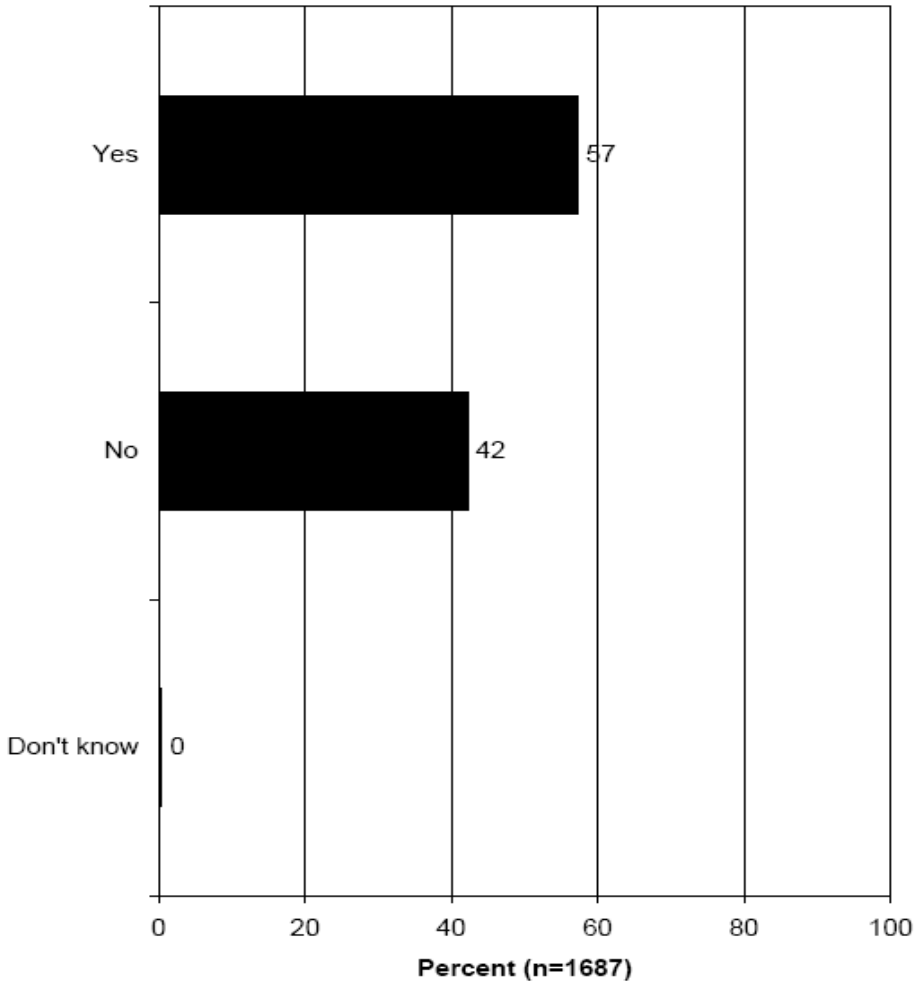
https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table

Pollutant	CAS Number	Human Health for the consumption of Water + Organism (µg/L)	Human Health for the consumption of Organism Only (µg/L)	Publication Year
Acenaphthene (P)	83329	70	90	2015

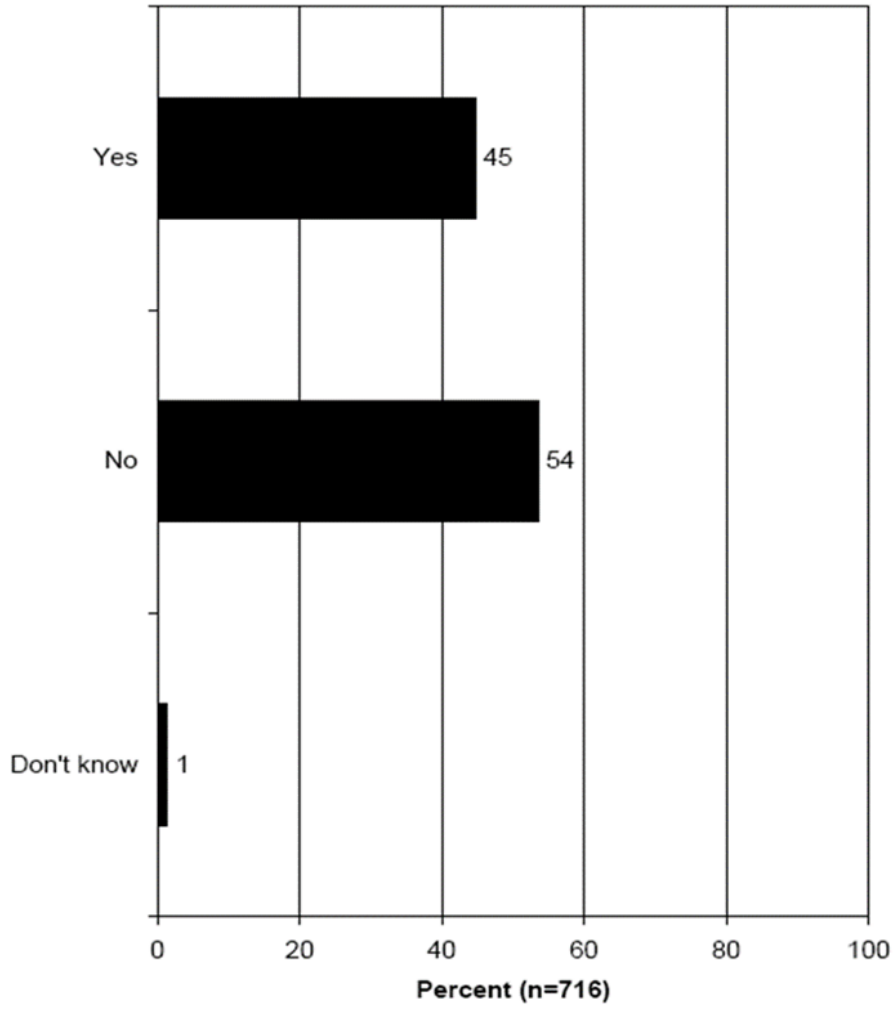
SURVEY OF WEST VIRGINIA RESIDENTS CONSUMPTION OF FISH

- **Telephone Survey of West Virginia Residents 18 Years of Age and Older**
- **Conducted in October 2008**
- **1,687 Interviews Completed**

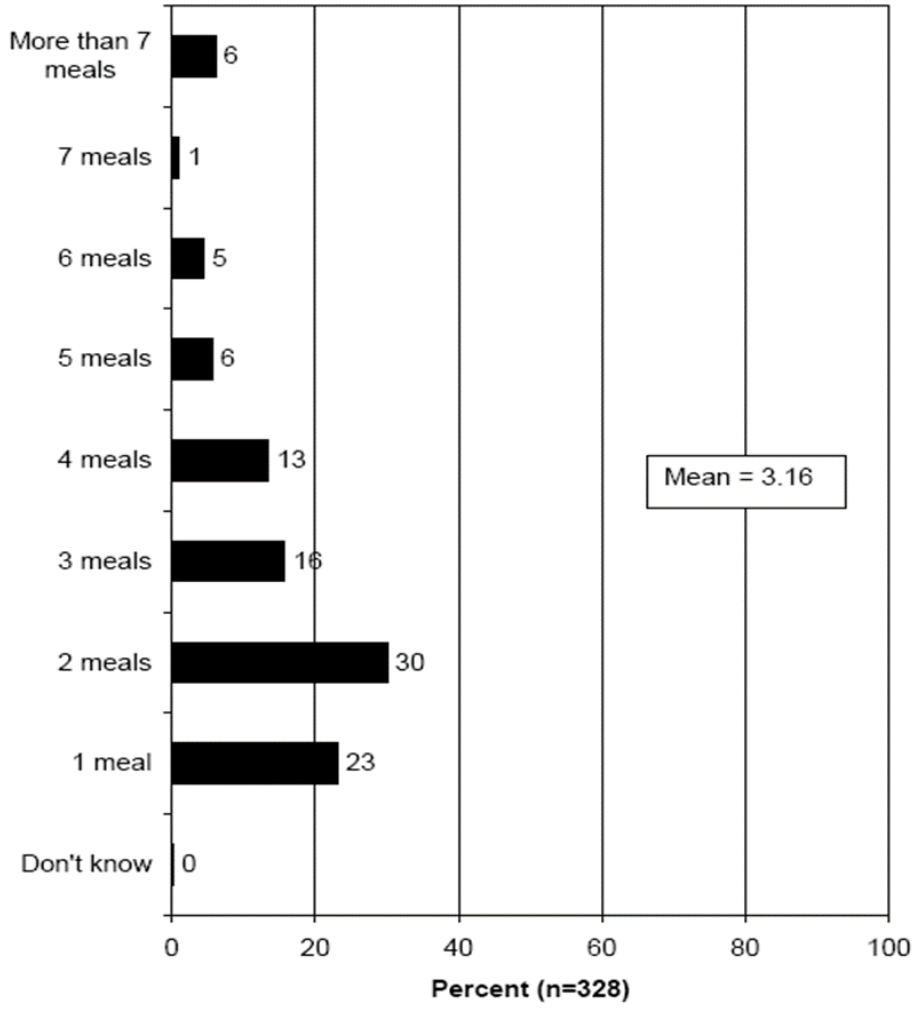
Q11. Have you eaten any freshwater fish, saltwater fish, or shellfish in the past 12 months?



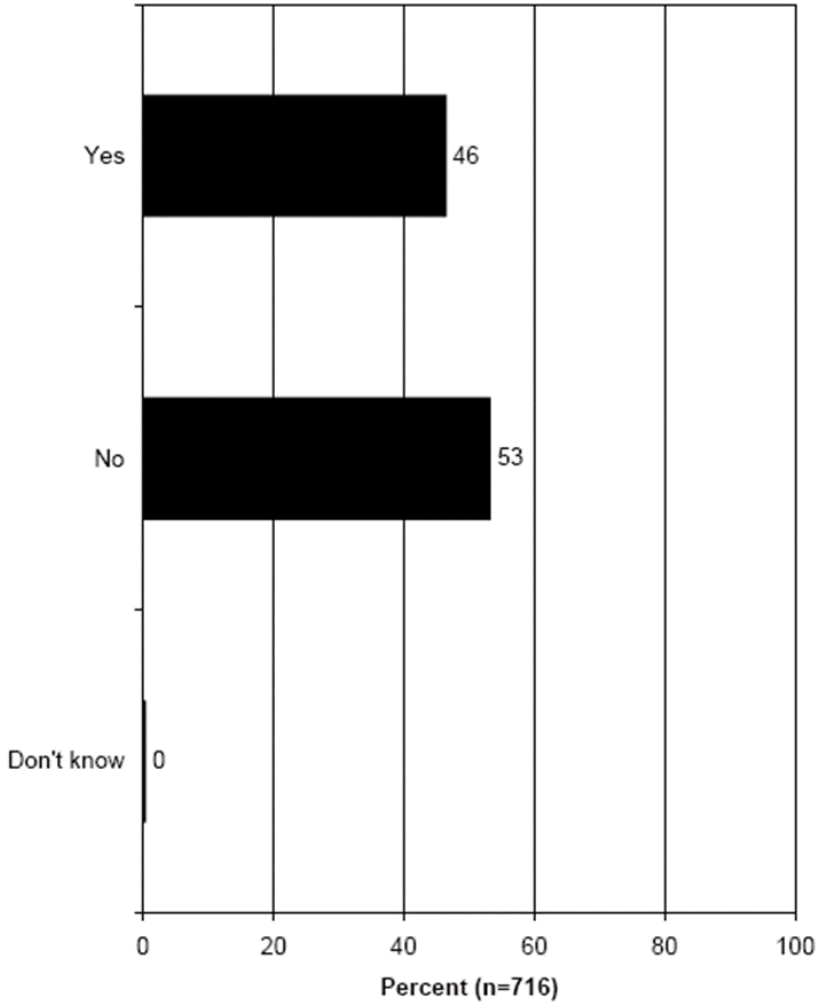
Q17. Have you eaten any freshwater fish in the past 30 days? (Asked of those who have eaten any freshwater fish in the past 12 months.)



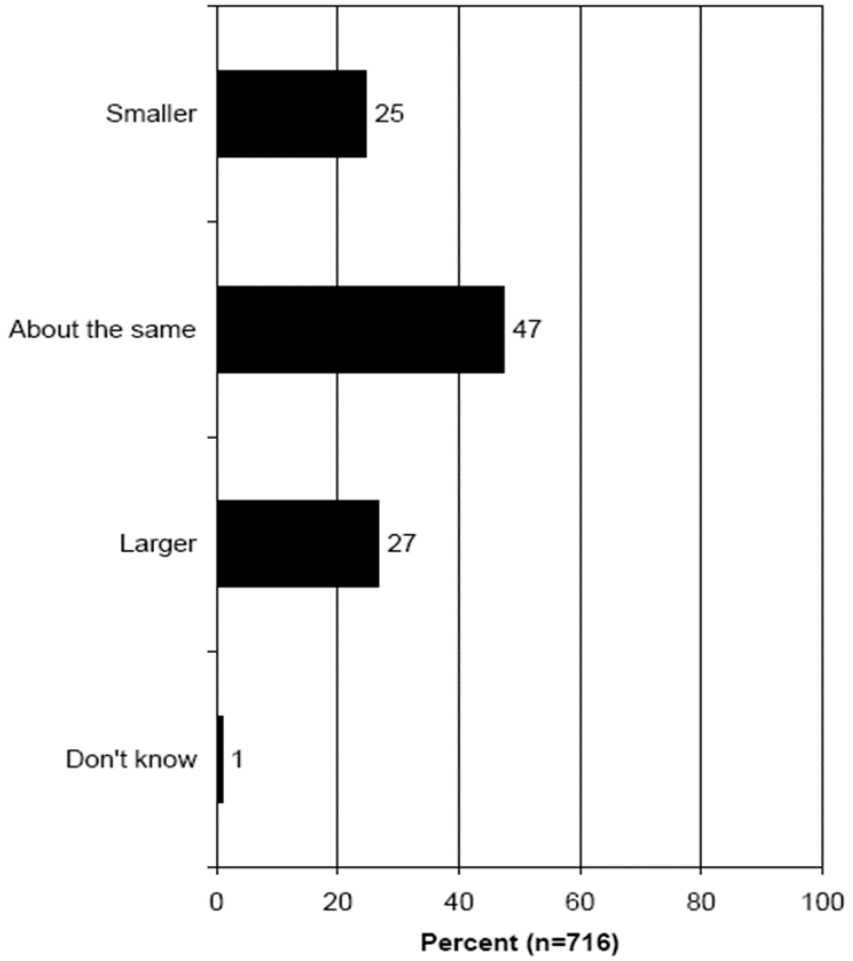
Q18. How many meals with freshwater fish would you say you have eaten in the past 30 days? (Asked of those who ate freshwater fish in the past 30 days.)



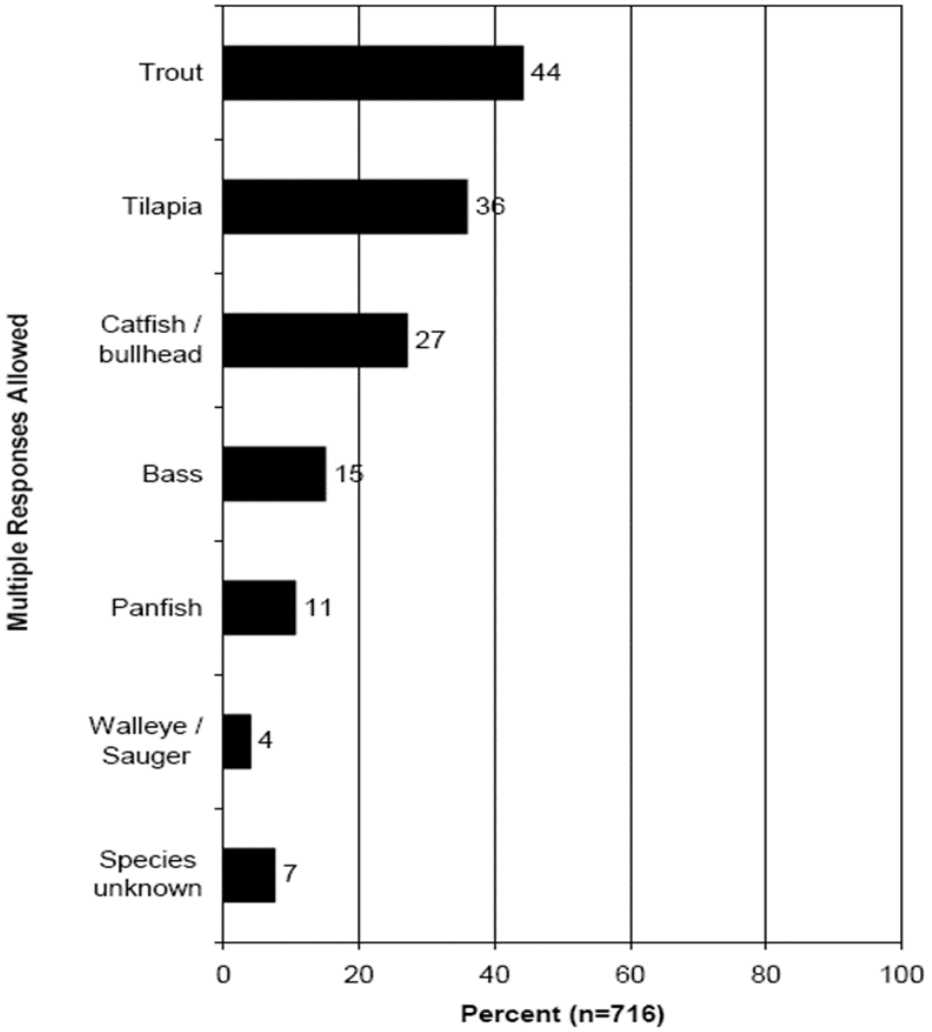
Q24. Have you been freshwater fishing in the past 12 months? (Asked of those who have eaten freshwater fish in the past 12 months.)



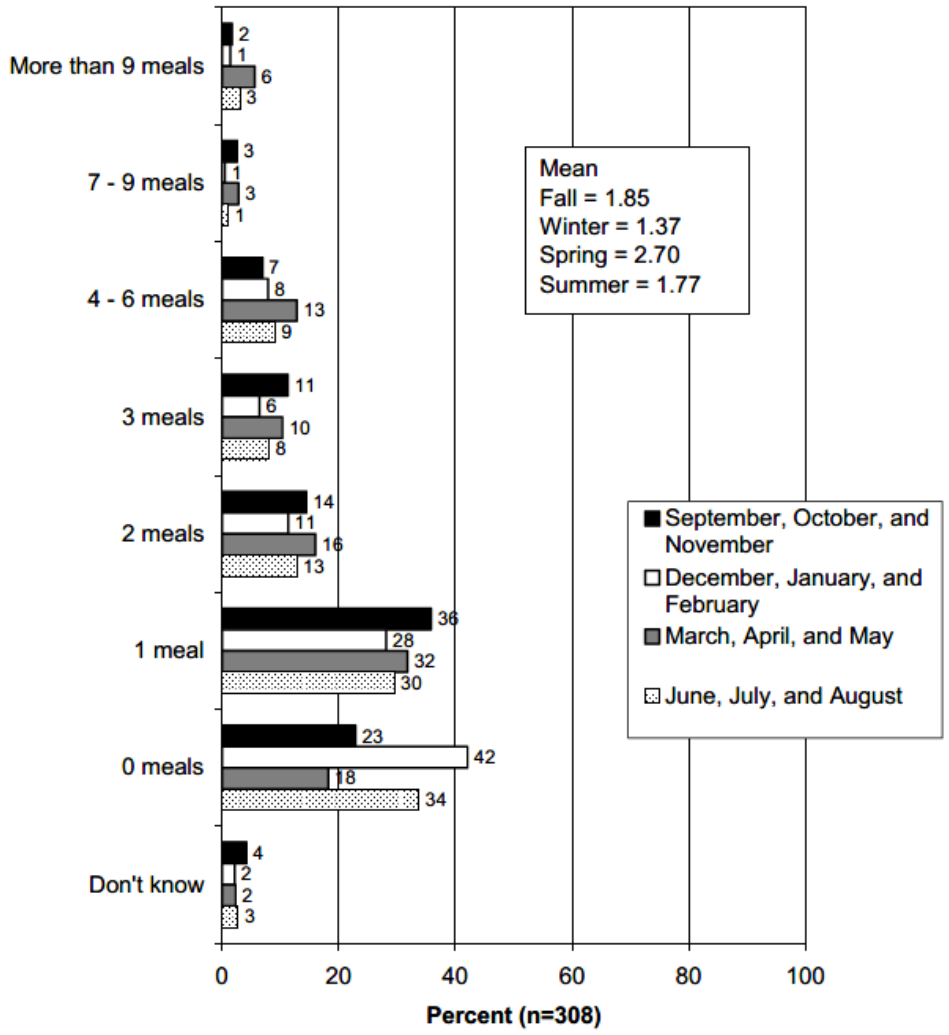
Q26. When you ate freshwater fish in the past 12 months, would you say you usually ate a portion that was smaller, about the same, or larger than 8 ounces? (Asked of those who have eaten freshwater fish in the past 12 months.)



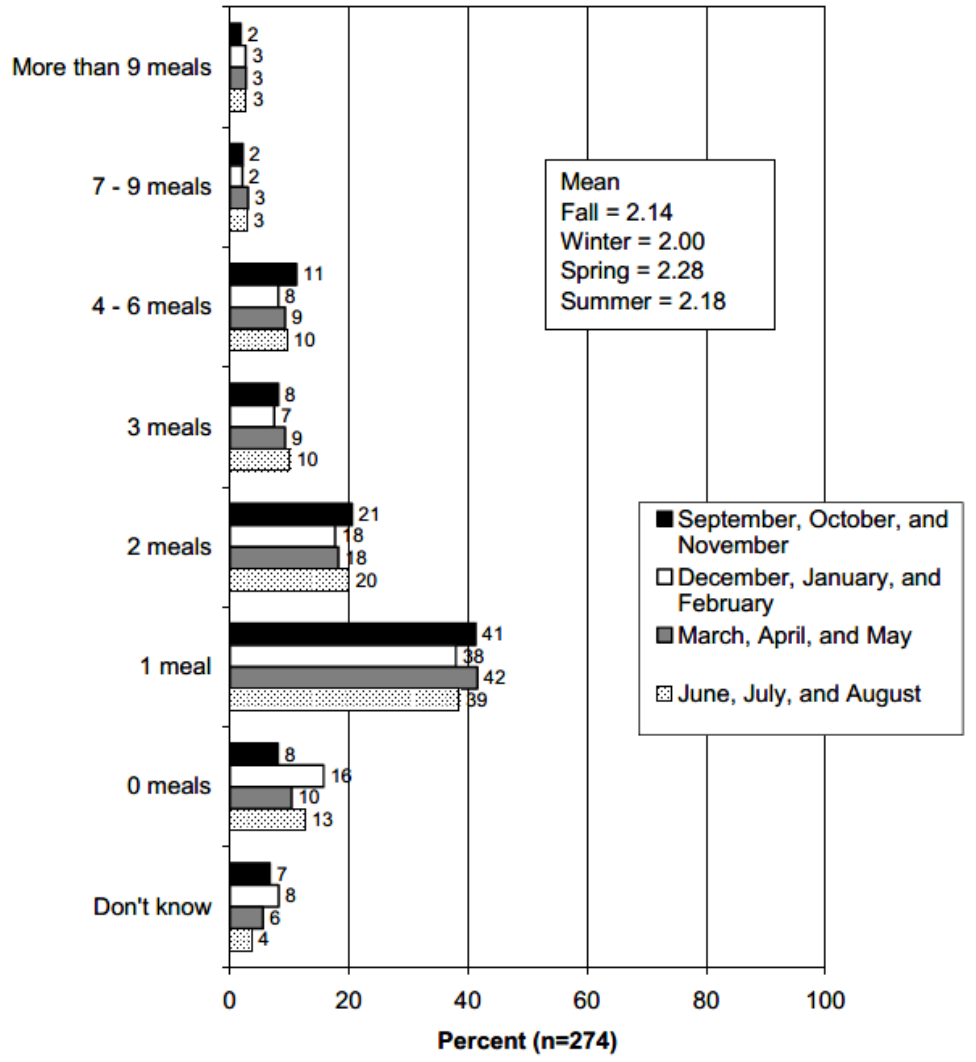
Q27. Which species or type of freshwater fish did you eat in the past 12 months? (Asked of those who have eaten freshwater fish in the past 12 months.)



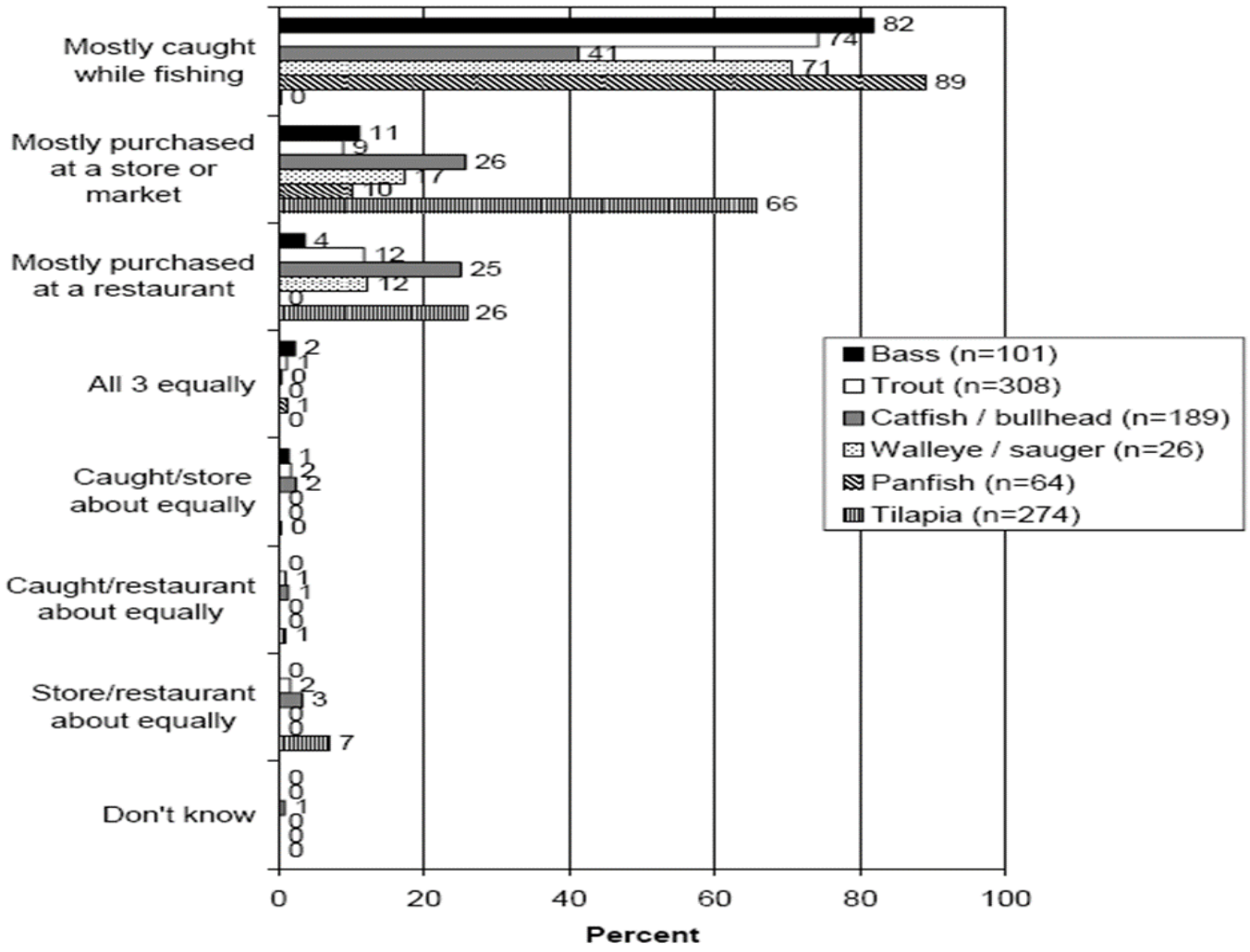
Number of meals including trout typically eaten in the past 12 months, by time period. (Asked of those who ate trout.)



Number of meals including tilapia typically eaten in the past 12 months, by time period. (Asked of those who ate tilapia.)



Q92. Was the freshwater fish you ate in the past 12 months mostly caught while fishing by you, family, or a friend, mostly purchased at a store or market, or mostly purchased at a restaurant?



CALCULATION BY RESPONSIVE MANAGEMENT
WEST VIRGINIAN-SPECIFIC FISH EATEN PER DAY

- Each WV resident 18 years or older who responded to the survey was included in the calculation, including those who did not eat any freshwater fish at all int he past 12 months
- Each respondent who ate freshwater fish was asked whether the size of the portion he/she ate over the past 12 months was smaller than 8 ounces, about 8 ounces, or larger than 8 ounces (eight ounces was described as "the size of a thin paperback book, a description taken from the American Cancer Society's website)
- After calculating the number of grams of freshwater fish per day per respondent, the 90th percentile was identified
- Data weighted for age and gender and calculated using a randomly assigned number to represent meals consumed that were smaller or larger than 8 ounces.

WV Daily Freshwater Fish Consumption

Weighted	random	90% of West Virginia residents 18 and older consume up to **9.94175056657534** grams of freshwater fish daily.

TROPHIC LEVEL ASSIGNMENTS
WV STUDY FISH

Fish *(specific fish in WV study)*	Trophic Level 2 Herbivores, or "primary consumers"	Trophic Level 3 Carnivores that consume herbivores	Trophic Level 4 Carnivores that consume other carnivores
Bass		0.5	0.5
Catfish		0.5	0.5
Panfish		1	
Sauger			1
Tilapia	1		
Trout		0.5	0.5

	of total 9.9 g/day
Trophic Level 2	2.9 g/day
Trophic Level 3	3.3 g/day
Trophic Level 4	3.7 g/day

OTHER STATES
REGARDING UPDATING HUMAN HEALTH CRITERIA

Kentucky	Held listening sessions on proposed modifications, not planning to revise HHC at this time
Pennsylvania	Recommended all 94 updates to their Environmental Quality Board in 2017
Texas	Updated 55 criteria. Used previous values for body weight, water consumption, fish consumption Used previous relative source contribution Did use BAFs from EPA 2015 update
Montana	Adopted EPA 2015 recommended criteria for fish + water ("Cat A")
Washington	Criteria promulgated by EPA with fish consumption specific to WA

Thank you!

and feel free to reach out with questions

Reach me at:

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