USNA 249
Lake Erie Public Health & Fish Consumption Project

Identifying and Providing At-Risk Communities with Safe Consumption Practices

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Case Western Reserve University - USNA 249 - Fall 2017, Spring 2018
Problem Statement

- Some Northeast Ohio Anglers rely on the fish they catch in Lake Erie and its tributaries as a major source of protein. These fish contain possibly dangerous levels of toxicants, contributing to serious public health issues in the future. The Cuyahoga County Board of Health is seeking the most effective ways to communicate such risks to these anglers.

- Understanding angling and consumption views and practices across the many cultural and economic backgrounds within this area is imperative to development and implementation of appropriate communication strategies.
Toxicants - Top 4 in Lake Erie Basin

Included in Ohio EPA Fish Consumption Advisory:

- **Polychlorinated Biphenyls (PCBs)** -- carcinogenic; damage to nervous, endocrine, reproductive, immune systems; high incidence of birth defects

- **Methylmercury** -- nervous system and brain damage, birth defects, carcinogenic
Toxicants - Top 4 in Lake Erie Basin

Not included in Ohio EPA Fish Consumption Advisory:

- **Dichloro-diphenyl-trichloroethane (DDT)** -- neurotoxin attacking central nervous system, carcinogenic

- **Dioxins** -- affect early development, disease-causing, carcinogenic
Pollution on Lake Erie

- **Point-source:** Resulting from direct entry point; industrial and municipal (sewage) plant discharge

- **Non Point-source:** Resulting indirectly from watersheds in area; urbanization and storm run-off, agricultural run-off

- **Atmospheric:** Acid Rain – “Smokestack” industry near the lake causing lowering of pH in rain

- **Legacy:** Chemicals affecting the current environment whose production and entrance into such environment occurred a length of time ago
Mercury (Hg) cycles from Earth to atmosphere to oceans and back to Earth. In the ocean, mercury is converted to monomethyl mercury (MMHg), a neurotoxin that moves up the food chain and becomes highly concentrated in tuna, swordfish, and other fish that people eat.
What’s Changed?

❖ Focus on tributary vs lakefront research
❖ Introduction to immigrant/refugee anglers
“Beaver Ridge”
What’s Changed?

❖ Focus on tributary vs lakefront research
❖ Introduction to immigrant/refugee anglers

Survey Locations

Fall 2017 Survey Sites
Spring 2018 Survey Sites
Objectives

❖ Obtain appropriate and complete data on Angler’s fishing habits and consumption on the Rocky River through conversational surveys

❖ Analyze data, attaining correlations and identifying needs

❖ Arrive at conclusions and subsequent recommendations for effective communication strategies on delivery of information to the population

❖ **Documents:** Survey and Consent Form
Data

- Abundant data from multiple ethnic and socio-economic backgrounds
- Responses given varied greatly, but showed some correlation between similar groups
- Overall, Rocky River hosts very diverse populations of anglers, and is a focal point for anglers in the area
Fall 2017 Survey Results

- Most (58%) typically prepared their fish by frying
- Top fish caught: Steelhead, Walleye, Perch, White Bass
Spring 2018 Survey Results

Top fish caught: Steelhead, Small Mouth Bass, Catfish, Large Mouth Bass Carp
Top 3 Fish of Rocky River

Steelhead Trout
23-30 inches long; 5-6 pounds

Smallmouth Bass
10-14 inches long; 1-3 pounds

Catfish
15-25 inches long; 2-10 pounds
Spring 2018 Survey Results:

- 62% claimed to have previous knowledge on fish and water contamination
  - Yet only 35% claimed to receive information on fish contamination
  - 44% of this group claimed this was from ODNR
    - 13% of entire sample (n=30)
- Upon relay of knowledge:
  - None displayed information fully pertinent to making educated decisions on consumption
  - 61% displayed some knowledge on contamination
  - 39% displayed zero or fully unsound knowledge on contamination
Spring 2018 Survey Results:

- Water quality concerns:
  - About a quarter of surveyed anglers (27%) expressed concern for water and fish quality
  - 65% were unaware or do not worry
  - 8% were unsure on their stance
Fish Consumption Rates on the Rocky River

- **Yearly**: 14%
- **Monthly**: 18%
- **Weekly**: 32%
- **Catch & Release**: 36%
Results - At Risk Groups, Weekly Consumption:

- 100% catch and bring home Steelhead Trout regularly
- 67% claimed to have prior knowledge on fish consumption and contamination
- Half are known to be using unsafe preparation methods* before consumption

*Unsafe preparation methods include:
  - Leaving fatty tissue, skin, bones, organs, or the head on prior to cooking the fish
  - And/or cooking the fish via method(s) which don’t allow for toxicant reduction
Fish Consumption Rates on the Rocky River

- Catch & Release: 36%
- Weekly: 32%
- Monthly: 18%
- Yearly: 14%
Results - At Risk Groups: Monthly Consumption

- 100% catch and bring home Steelhead Trout regularly
- 80% claimed to have prior knowledge on fish consumption and contamination
- 60% are known to be using unsafe preparation methods* before consumption

*Unsafe preparation methods include:
  - Leaving fatty tissue, skin, bones, organs, or the head on prior to cooking the fish
  - And/or cooking the fish via method(s) which don’t allow for toxicant reduction
Fish Consumption Rates on the Rocky River

- **Catch & Release**: 36%
- **Weekly**: 32%
- **Monthly**: 18%
- **Yearly**: 14%
Results - Yearly Consumption:

- 75% catch and bring home Steelhead Trout regularly
- 50% claimed to have prior knowledge on fish consumption and contamination
- 75% are known to be using unsafe preparation methods* before consumption

*Unsafe preparation methods include:
  - Leaving fatty tissue, skin, bones, organs, or the head on prior to cooking the fish
  - And/or cooking the fish via method(s) which don’t allow for toxicant reduction
Spring 2018 Survey Results

- Correlation between immigrant (non-primary English speaking and non-English speaking) populations and overconsumption of fish
- Apathy from English-speaking groups with less fishing gear
- Most (85%) believed more information would be helpful
  - 96% of this group recommended signage for more information
- Extreme lack of general knowledge on Lake Erie pollution—totoxicants, consumption, safe preparation methods
Existing Park Signage (Continued)
### Ohio DNR Fishing Regulations

<table>
<thead>
<tr>
<th>Fish Species</th>
<th>Daily Catch Limit</th>
<th>Minimum Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Catfish (&lt;28 inches)</td>
<td>6 (public lakes under 700 acres)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>No limit (all other public waters)</td>
<td></td>
</tr>
<tr>
<td>Channel Catfish (≥28 inches)</td>
<td>1 (statewide)</td>
<td>28 inches</td>
</tr>
<tr>
<td>Largemouth, Smallmouth, &amp; Spotted Bass</td>
<td>5 (singly or in combination)</td>
<td>12 inches</td>
</tr>
<tr>
<td>Striped, Hybrid-striped, &amp; White Bass</td>
<td>30</td>
<td>No more than 4 over 15 inches</td>
</tr>
<tr>
<td>Trout (all species)</td>
<td>5 (singly or in combination)</td>
<td>None * Specific Size Sight-Dependent</td>
</tr>
</tbody>
</table>

### EPA Fish Consumption Advisory

<table>
<thead>
<tr>
<th>Recommended Consumption</th>
<th>Fish Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two meals/ week</td>
<td>Yellow perch, sunfish (e.g., bluegill, green, longear, redeer)</td>
</tr>
<tr>
<td>One meal/ week</td>
<td>All fish not specified in this table</td>
</tr>
<tr>
<td>One meal/ month</td>
<td>Flathead catfish 23” and over, northern pike 23” and over, steelhead trout from Lake Erie and its tributaries</td>
</tr>
</tbody>
</table>
Challenges

❖ Language barrier
❖ Assessment of primary language
  ❖ Language identification preparation
❖ Honesty & Level of Responsiveness
  ❖ Social Desirability Bias - Continual Reshaping
Fish Advisory Development

- Fall 2017 class focused on simplification of fish preparation
- Need for simplification of fish consumption amounts in specific locations

Methods of Fish Preparation

<table>
<thead>
<tr>
<th>Best Methods</th>
<th>Acceptable Methods</th>
<th>Worst Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grill</td>
<td>Bake</td>
<td>Pan Fry</td>
</tr>
<tr>
<td>Smoke</td>
<td>Poach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deep Fry</td>
<td></td>
</tr>
</tbody>
</table>

- If deep-frying, **discard oil** after use.
- **Pan frying** removes few, if any, contaminants.

Clean and Cut:

Anglers can minimize exposure to contaminants by:
- Discarding **organs** (do not eat).
- **Remove skin** from fillets or steaks.
- **Trim away fatty areas** near the belly, back, and sides.
Future of the Project

❖ Deeper look into toxicant levels of fish
  ❖ ODNR Contacts
  ❖ Case or Baldwin Wallace Tissue Sampling

❖ Better understanding of atypical wild-life ingestion:
  ❖ Algae, clams, crayfish
  ❖ Cultural norms of refugee & immigrant pplns

❖ Sign production and optimization

![Graph showing steelhead trout stocking numbers in the Rocky River from 2013 to 2017. Numbers decrease from 110,000 in 2013 to 80,000 in 2017.](image)
References

-Gandhi N, Drouillard KG, Arhonditsis GB, Gewurtz SB, Bhavsar SP. 2017. Are fish consumption advisories for the Great Lakes adequately protective against chemical mixtures? Environmental Health Perspective 125:586-593; http://dx.doi.org/10.1289/EHP104


Thank You