



IDAHO FISH CONSUMPTION RATE RECOMMENDED SAMPLE AND QUESTIONS

PREPARED FOR THE IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY BY
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INTRODUCTION

BACKGROUND

The Idaho Department Environmental Quality, IDEQ, contracted with the Boise State University Public Policy Center (PPC), to develop a fish consumption questionnaire and a sample design. The IDEQ is responding to the US Environmental Protection Agency's (EPA) May 2012 disapproval of Idaho's 2005 update of its human health criteria, based in part on a fish consumption rate of 17.5 g/day. EPA said it could not conclude that this was protective of all who consume fish from Idaho waters. Thus, IDEQ needs to know how often Idahoans eat fish (or shellfish), how much they eat, where they get this fish (or shellfish) – are they from Idaho waters or elsewhere – and, if from Idaho waters, are the fish resident or migratory. In fulfillment of this contract, PPC staff participated in the IDEQ negotiated rule-making committee process, the tribal fish consumption rate technical group, and with outside consultants as part of the study process. This draft report reflects PPC's work and its collaboration with interested stakeholders and organizations. There are a number of unique attributes to surveying episodic events and individual's perceptions that have been incorporated into this report and recommendations.

PPC made recommendations of a sample design that will require up to 7,000 surveys necessary to reach the statistical confidence levels requested by IDEQ. The sample design provides flexibility of several statistical methodologies for calculating distribution, with confidence bands, of the long-term average rate of consumption of fish and shell fish (expressed as a daily average rate) for two target populations: all adult Idaho residents, and adult resident anglers.

PPC developed a draft questionnaire for a blended telephone/Internet survey, to be initiated with a mailed invitation to participate. The mailed invitation will include visual aids for species and portion size for those who select to participate by phone. The same visual aids will be available online for those selected to participate via Internet. The recommendations for the questionnaire provide sufficient information as one of several factors that go into calculation of revised criteria to protect human health and regulate discharge of toxic pollutants into Idaho waters.

IDEQ requested consideration of the possibility of using a 24 hour recall method pioneered by the National Cancer Institute (NCI) for episodic food consumption. One of the challenges of implementing this survey will be getting an accurate amount and frequency of consumption of fish. The 24 hour recall method is one approach to reduce a number of the possible recall biases that can occur. However, this method imposes rigorous constraints on the sample design recommendation. This method, in contrast to other methods, requires that the researcher is able to identify a respondent who has consumed fish within the prior 24 hours. The respondent must also be amenable to a call back in the future that happens to coincide within 24 hours of another episodic consumption. It is this method that is driving the sample size. There is great potential for improving estimated episodic consumption of a population under this method. As IDEQ is considering increasing the research design, PPC insured that the questionnaire and sample design recommendations could accommodate other statistical methods.

There was also concern expressed that seasonality may skew the results of Idahoans' consumption of fish, depending upon when the survey is conducted. The Idaho Department of Fish and Game (IDFG) has designated seasons for when fish can be taken from Idaho waters. Recall surveys provide for the seasonality variance in respondents' consumption patterns. PPC recommends two approaches that IDEQ may adopt. The first is a seasonal approach, over three seasons, to provide a time frame to test for the impact of seasonal consumption. The fishing season can logically be broken into three periods: January – April (winter season), May – September (considered high season for most recreational fishing),

and October – December (late season fishing). An alternative to three seasons would be to interview a portion of the sample each month over the 12-month period. This method would be better adapted to the NCI method in that the recall survey could be conducted within a more traditional time frame of two weeks. It is beyond the scope of this report to recommend how to correct for seasonality.

There was considerable discussion about how to ensure representation of difficult to reach populations, those with ethnic origins whose culture traditionally consumes fish. Also of interest are populations of low income individuals, in which subsistence fishing is a regular part of the normal diet. PPC recognizes that these groups may reside in Idaho, and that it is possible that these populations may not be proportionately represented because they do not have a permanent address, telephone service, or an Idaho fishing license. PPC does not recommend that IDEQ take extraordinary efforts to identify these groups beyond those captured in the sample frame. Once this study is complete IDEQ will have a better idea of whether they have proportionately captured these subpopulations. To the extent possible, the proportionate weight can be adjusted for the low income and ethnic minority respondents.

There will be tradeoffs necessary between objectives outlined and IDEQ's implementation and analysis budget. The negotiated rule-making committee has been made aware of the tradeoffs being considered and the potential impact of choosing one alternative over another.

Project Overview:

IDEQ tasked PPC with designing a survey from which IDEQ can determine the distribution of Idahoans' long-term rates of consuming fish and shellfish. This report provides recommendations of a questionnaire to solicit the information desired by IDEQ and recommendations for a sample design to reflect the consumption patterns of Idaho residents. Specifically, this report provides recommendations for:

1. Determining the frequency and quantity of finfish or shellfish that Idahoans consume.
 - a. Identify if fish were Idaho caught, market purchased, or fish consumed in pre-prepared foods and restaurants.
 - b. Identify the type of fish by fish groupings, and the amount of fish consumed by percentile, including Idahoans who are high consumers, for example the 95th percentile or other statistic.
2. Determining the perception of whether fish consumption rates have been suppressed by external factors.
3. Identifying basic socio-economic characteristics in order to compare the IDEQ responses to national and tribal survey responses.

Additionally, the design process has been coordinated with the current and ongoing EPA and Idaho Tribal Initiative through developing a core set of questions to capture the respondents' age, income and ethnicity. The survey design incorporates:

1. When the survey should be given to capture seasonality
2. Random selection of the participants, sample size and statistical analysis
3. Appropriate quality control and quality assurance
4. Representation of the population
 - a. General population (all citizens of Idaho)
 - b. Sub-population (recreational anglers)
5. Identification of high-end consumers
6. Internal validity and recommendations for external reliability

FISH CONSUMPTION RATE SURVEYS AND ARTICLES

A number of studies and articles have been reviewed in the preparation of this report. A summary of the most significant material is included here for background information. There is additional information included in the

Appendices to this report. The recommendations in this report have been based, in part, on previous studies and articles written about dietary and fish consumption surveys. The focus of the review has been on the characteristics of target populations and analytic methods for identifying quantity of episodic consumption.

A New Statistical Method for Estimating the Usual Intake of Episodically Consumed Foods with Application to Their Distribution¹

The Tooze et al. article makes the argument for the NCI method, which generated considerable discussion in the rulemaking process. To date, this method was used for dietary nutritional intake. While there are similarities between a national nutritional dietary survey and this survey, there are also differences that raise concern. The concern is that the NCI method was developed with the assumption that all respondents will always answer in the affirmative, as ever consumers. It is possible that when looking at a single food intake that a respondent may be a never consumer. There is a subtle but important assumption embedded in the NCI approach. It assumes that the in-person variation is greater day to day than the between-person variation. Thus if one is able to determine the in-person day to day variation you will be able to estimate the between-person variation.² When between-person variations are small, the model holds and allows the assumption that the 24-hour transformed recall intake is an unbiased estimator of the transformed usual intake. This contrasts with the Iowa State method³ that assumes the 24-hour recall is an unbiased estimator of the untransformed usual intake. This is a problem, as it is known that fish intake is a heavily skewed distribution.⁴

Behavioral Risk Factor Surveillance System (BRFSS)⁵

The U.S. Center for Disease Control and Prevention conducts surveys in which they allow states to include their own questions. Idaho Department of Health and Welfare inserted a food frequency question in the 2007 and the 2012 BRFSS surveys. The survey asked about both the frequency of fish consumption as well as whether it was an Idaho caught fish. The survey interviewed respondents over a 12 month period providing insight into the seasonality question. The BRFSS data indicates that approximately 80 percent of Idahoans consume fish at least once a month and 17 percent consume an Idaho caught fish at least once a month. These values were used in determining the response rates for the 24-hour recall sample. Two additional observations are relevant from the BRFSS Idaho data. The first is that socio-economic status had no impact upon consumption of Idaho fish. Second, seasonality may be relevant for Idaho-caught fish, particularly in the fall. Appendix C provides the preliminary data from the BRFSS.

Columbia River Inter Tribal Fish Consumption (CRITFC)⁶

The CRITFC (1994) report was found to be useful in what the authors identified as possible weaknesses in their report. The survey was conducted in November, a month of low fish consumption. The report conjectured that timing may lead to an underestimate of fish consumption. Most interviews were conducted at a central location, and the survey noted that the probability of being interviewed declined as a function of distance from the interview site. The

¹ Tooze, Janet A., PhD, M.P.H.; Douglas Midthune, Ms.; Kevin W. Dodd, PhD; Laurence S. Freedman, PhD; Susan M. Krebs-Smith, PhD, M.P.H., Rd; Amy F. Subar, PhD, M.P.H., Rd; Patricia M. Guenther, PhD, Rd; Raymond J. Carroll, PhD; Victor Kipnis, PhD, 2006, "A New Statistical Method for Estimating the Usual Intake of Episodically Consumed Foods with Application to Their Distribution", *Journal of the American Dietetic Association*, Vol. 106, No 10, pp1575-1587.

² Usual Dietary Intakes: Background, <http://riskfactor.cancer.gov/diet/usualintakes/> Last accessed 7/26/2013

³ Op. cit. Tooze, p.2577

⁴ Kevin W. Dodd, Ph.D.; Patricia M. Guenther, Ph.D., Rd; Laurence S. Freedman, Ph.D.; Amy F. Subar, Ph.D., M.P.H., Rd; Victor Kipnis, Ph.D.; Douglas Midthune, Ms.; Janet A. Tooze, Ph.D.; Susan M. Krebs-Smith, Ph.D., M.P.H., Rd, Statistical, "Methods for Estimating Usual Intake of Nutrients and Foods: A Review of the Theory" *J Am Diet Assoc.* 2006; 106:1640-1650.

⁵ Idaho Bureau of Vital Records and Health Statistics, 2012, Data collected from The Behavioral Risk Factor Surveillance System (BRFSS) 2012, Idaho Division of Public Health, Environmental Health Program, 450 W. State Street, 6th Floor Boise, ID 83702

⁶ Columbia River Inter-Tribal Fish Commission (CRITFC), 1994, *A Fish Consumption Survey of the Umatilla, Nez Perce, Yakama, and Warm Springs Tribes of the Columbia River Basin*. Accessed by web. (<http://www.deq.idaho.gov/media/895853-fish-consumption-survey-1994.pdf>)

recommendations for Idaho derived from the CRITFC report include sampling several times within a year to capture any seasonality. Additionally, the study is valuable in that it identifies limitations of in-person surveys. Conducting in-person surveys across a wide geographical area, such as Idaho, is expensive and difficult to administer without introducing systematic bias into the data.

Idaho Department Fish and Game Annual Angler Survey⁷

The IDFG angler surveys for 1994, 1999, and 2006 had a sample size range between 1,200 to 2,000 license holders. They received response rates that ranged from 45 to 58 percent.⁸ The relatively high response rate may be due to the heightened interest of participants in the survey with the health of fish populations. Additionally, as with the Spokane River survey, both used mailers to introduce the target population to the study (Spokane Regional Health District 1998). The other directly relevant information from the surveys is that Idahoans preferred, and most often, ate trout. This suggests that when developing fish categories, trout should have their own grouping.

National Health and Nutritional Examination Survey⁹

The 2011 EPA national estimates for fish consumption were based on the National Health and Nutritional Examination Survey (NHANES). This survey is intended to assess the health and nutritional status of Americans by sampling about 7,000 residents a year. The NHANES study employed a statistical method being considered by IDEQ to establish a valid within person variance. The consumption of food frequency can be reliably estimated¹⁰; it is more problematic to derive the quantity of fish consumed. Washington State reanalyzed this data using the 24-hour recall probabilistic model developed by the National Cancer Institute, NCI¹¹. The conclusions of the study about fish eating patterns may be less relevant for Idaho as there are questions about whether or not Idahoans are similar to residents of coastal states.

Per Capita Fish and Shellfish Consumption in Florida¹²

The 1994 Florida fish consumption survey provides a foundation for the mixed method and 7-day recall recommendations found in this report. The University of Florida developed a mixed survey method of telephone and in-person survey instrument for a food frequency survey that used a 7-day recall. The study used a sample of 8,000 telephone interviews over a 52-week constant quota approach and a similar number of in home and away from home personal interviews. The authors provide an extended discussion in support for the 7-day recall time period.¹³ Dietary intake surveys generally use a 24-hour recall with the justification that people have poor recall for longer periods of time. There are two rationales for using a 7-day recall. The first is that in affluent countries, with widely varied diets, the shorter the recall the less representative it is of individual's usual consumption. The second is that it has been found that there is a high level of agreement for either commonly eaten or rarely eaten foodstuffs individuals can accurately recall.

⁷ Idaho Department of Fish and Game, 2013-2018 Fisheries Management Plan, pp. 65-69, <http://fishandgame.idaho.gov/public/fish/planFisheries.pdf>

⁸ See Willard, IDFG, 2007

⁹ Center for Disease Control and Prevention, "National Health and Nutrition Examination Survey, http://www.cdc.gov/nchs/nhanes/nhanes2011-2012/overview_g.htm, last accessed December 3, 2013

¹⁰ The Behavioral Risk Factor Surveillance System is an example of food frequency survey that reliably measures food consumption frequency.

¹¹ Janet A. Tooze, PhD, M.P.H.; Douglas Midthune, Ms.; Kevin W. Dodd, PhD; Laurence S. Freedman, PhD; Susan M. Krebs-Smith, PhD, M.P.H., Rd; Amy F. Subar, PhD, M.P.H., Rd; Patricia M. Guenther, PhD, Rd; Raymond J. Carroll, PhD; Victor Kipnis, PhD, 2006, "A New Statistical Method for Estimating the Usual Intake of Episodically Consumed Foods with Application to Their Distribution", *Journal of the American Dietetic Association*, Vol. 106, No 10, pp1575-1587.

¹² Degner, R.L., Adams, C.M., Moss, S.D., Mack, S.K. 1994. *Per Capita Fish and Shellfish Consumption in Florida, Submitted to the Florida Department of Environmental Protection, in Fulfillment of Contract WM-476, University of Florida Digital Collections*. Accessed by web. <http://ufdc.ufl.edu/UF00027555/00001>

¹³ See Appendix A for citations on the 7-day recall articles.

Washington Department of Ecology Fish Consumption Rates (FCR)¹⁴

The State of Washington had access to a number of FCR surveys on its population.¹⁵ These earlier studies provided a foundation for the current draft Technical Support Document. Reliability of results improves as more studies are conducted. The fact of having a number of years of data makes the Washington study particularly valuable as a source document. The draft study under review illustrates several important issues that have been discussed during the Idaho negotiated rule-making sessions held by IDEQ. The Washington survey points out that there can be a wide deviation in consumption by population. There have been four tribal surveys and a number of surveys that produced a range of 6 g/day of fresh water fish for recreational anglers to 214 g/day for the Suquamish Tribe¹⁶. How subpopulations of Idahoans may impact the statewide FCR has been carefully considered in this process.

1998 Fish Consumption Survey, Spokane River, Washington WDEQ¹⁷

The Spokane River FCS, 2.5 miles east of the Idaho-Washington state-line, is geographically most similar to Idaho. The survey group was licensed anglers. While the study did not quantify the amount of fish consumed, it does offer insight into what the expected response rate may be and what may be expected as a catch and keep rate. The response rate for this sample of people with fishing licenses was 31.35%.¹⁸ “Of the respondents who completed the survey, 59.1% reported keeping fish for themselves.”¹⁹

SURVEY METHODS

As illustrated above, there are a number of articles and sources that cover the strengths and weaknesses of different survey methods. The appropriate method for IDEQ will be determined by a number of factors that include focus of the survey, geographical considerations, and budget. The following is a summary of the different methods to assist IDEQ in determining the appropriate method in consultation with the implementing consultant. These were discussed at length during the IDEQ rule-making process meetings, and during the PPC research discussions with IDEQ, EPA representatives, and consultants. Several survey methods are described here for general reference. For a more complete overview, reference the Washington State 2012 studies, cited above and in Appendix A to this report.

Diary Approach

This method asks respondents to keep a journal of their consumption over an extended period of time. This approach is frequently used when data over time is the priority.

- A. The strengths of the diary method include:
 1. The ability to provide a representative sample of the population for the purposes of statistical analysis, including the use of stratified sampling to “oversample” rare cases or events.
 2. Recall bias is relatively low.
 3. Consumption patterns over longer periods of time can be more directly assessed.
 4. Visual aids may be provided to respondents to improve the accuracy of the reporting of portions.
- B. The limitations of the diary method include:

¹⁴ Washington Department of Ecology, August 2012. *Fish Consumption Rates Technical Support Document A Review of Data and Information about Fish Consumption in Washington*. Accessed by web. (<https://fortress.wa.gov/ecy/publications/publications/1209058.pdf>)

¹⁵ See Appendix A for list of studies used in the Washington Department of Ecology FCR study

¹⁶ Washington Department of Ecology, August 2012. *Fish Consumption Rates Technical Support Document A Review of Data and Information about Fish Consumption in Washington*, page xvi, Accessed by web. (<https://fortress.wa.gov/ecy/publications/publications/1209058.pdf>)

¹⁷ Spokane Regional Health District. 1998. 1998 Fish Consumption Survey, Spokane River, Washington, Survey Report. Spokane Regional Health District, Assessment/Epidemiology Center. November 1998.

¹⁸ WDEQ, 1998, Fish Consumption Survey Spokane River, Washington, Spokane Regional Health District Assessment/Epidemiology Center

¹⁹ *ibid*, p2

1. A relatively high-cost method, as respondents must generally be provided face-to-face instruction on recording their diet (necessitating the training of research assistants and the expense of travel).
2. Data collection requires a longer period of time.
3. The accuracy of the respondents' records can be spotty or inconsistent.
4. Given the requirement of a long-term commitment to recording, response rates and completion rates can be problematic.

Creel Approach

The method identifies respondents at the site at which they are fishing. This method is frequently used to determine take rates from specific bodies of water.

- A. The strengths of the creel method include:
 1. The ability to provide information specific to particular waterways or watersheds.
 2. An angler's catch can be visually verified as to size and species, and models may be displayed to respondents to assess consumption portions.
 3. The recall bias is low.
 4. The response rate is generally high.
- B. The limitations of the creel method include:
 1. It is impossible to get a representative sample so statistical inference is impossible and results cannot be generalized to the population. Those who fish frequently are likely to be over-represented.
 2. It is a high-cost method. Interviewers must be highly trained, travel expenses can be considerable, and the geographical isolation of many recreational fishing areas exacerbates these problems.
 3. All fishing sites selected must be surveyed at all times of day and throughout the year to provide comprehensive information.
 4. Suppression rates likely have larger impacts upon anglers than upon the general population.

In-Person Interviews

This method administers questionnaires in person to respondents who have been randomly selected for participation.

- A. The strengths of personal interviews include:
 1. The ability to provide a representative sample of the population for the purposes of statistical analysis, including the use of stratified sampling to "oversample" rare cases or events.
 2. Recall bias is relatively low, especially with 24-hour consumption rates.
 3. Models may be employed to assess portion sizes.
 4. Interviews are more likely to be completed.
- B. The limitations of personal interviews include:
 1. A high-cost method, including the costs of training, travel, and supervision.
 2. Shorter questionnaires are generally required to minimize completion time, which limits the amount of information that can be obtained.
 3. A more limited sample size is generally required, reducing the generalizability of the results.
 4. Given the requirement that respondents receive a stranger into their home, response rates can be problematic.

Mail or Internet Surveys

This method entails the self-administration of a questionnaire by respondents who have been randomly selected for participation. It is gaining in popularity because it incorporates advantages of in-person interviews and telephone surveys.

- A. The strengths of mail or Internet surveys include:

1. The ability to provide a representative sample of the population for the purposes of statistical analysis, including the use of stratified sampling to “oversample” rare cases.
 2. Easier to conduct interviews statewide and in more remote areas.
 3. The most cost-effective method. In the case of mail surveys, postage and coding are principle costs, and training and supervisory expenses are low. Internet surveys eliminate the need for postage and manual coding.
 4. Respondents’ attempts to please interviewers are dramatically reduced.
 5. A wider range of questions can be asked than is generally the case in a telephone or personal interview.
- B. The limitations of mail or internet surveys include:
1. Response rates can be problematic as requests to complete surveys may be discarded with “other” junk mail or spam (although the effect of this bias can be assessed).
 2. Without the prompting of an interviewer or the ability of a respondent to seek clarification of a question, accuracy can be diminished.
 3. Identifying a sampling frame can be problematic, especially with Internet surveys.
 4. The completion rate is often dramatically lower than with telephone and personal interview surveys.
 5. Recall bias is higher, and accuracy is lower. Since models cannot be employed to assess portion size, reference must be made to common objects (e.g., a deck of cards).

Telephone Surveys

This method administers questionnaires to respondents who have been randomly selected for participation. It is frequently used when there is large geographic area of interest, budget is a concern and time is an important factor.

- A. The strengths of telephone surveys include:
1. The ability to provide a representative sample of the population for the purposes of statistical analysis, including the use of stratified sampling to “oversample” rare cases.
 2. Far easier to conduct interviews statewide and to cover more remote areas.
 3. Extremely cost-effective. Training time and the cost of supervision are dramatically lower, and travel expenses may be nonexistent.
 4. Interviews are more likely to be completed.
- B. The limitations of telephone surveys include:
1. Response rates can be problematic. The near-ubiquity of cell phones and caller ID has reduced the response rates of telephone surveys.
 2. Timing of the calls may bias the demographics of respondents (evening calling generally produces the highest response rate, but will underrepresent those who work evenings, two jobs, etc.).
 3. Identifying a sampling frame can be problematic (although random dialing, while not ideal, resolves this difficulty).
 4. Recall bias is higher, and accuracy is lower. Since models cannot be employed to assess portion size, reference must be made to common objects (e.g., a deck of cards).

Telephone-Mail/Internet-Telephone Approach

This method entails sampling respondents and making initial contact by telephone, and then subsequently sending them a self-administered mail-in or Internet survey. This can be followed with telephone reminders that also give the respondents the ability to seek clarification. Often the mixed method is chosen in order to increase the response rates.

- A. The strengths of the telephone-mail/Internet-telephone approach include:
1. The ability to provide a representative sample of the population for the purposes of statistical analysis, including the use of stratified sampling to “oversample” rare cases.
 2. Easier to conduct interviews statewide and in more remote areas.

3. A cost-effective method. Research assistants are necessary to make initial contact, but since surveys are only sent to those agreeing to participate, costs associated with postage and printing are reduced.
 4. The attempt of a respondent to please the interviewer is dramatically reduced.
 5. A wider range of questions can be asked than is generally the case in a telephone or personal interview.
- B. The limitations of mail or Internet surveys include:
1. Response rates can be problematic given the nature of telephone surveys (and assessing this bias is far more difficult than with straight mail-in surveys).
 2. Recall bias is higher, and accuracy is lower. Since models cannot be employed to assess portion size, reference must be made to common objects (e.g., a deck of cards).
 3. Identifying a sampling frame can be problematic (although random dialing can resolve this to some extent).
 4. Although the completion rate is better than with straight mail surveys, it is lower than with telephone and personal interview surveys.

PPC recommends that a telephone – mail/Internet-telephone method be used.

Bias from Respondent and Researcher

There were a number of questions raised by participants in the Fish Consumption Survey Technical Group about reducing respondent and researcher bias. The instructions to the interviewer will have the greatest impact on reducing these biases through training. However, the introduction of bias through the Internet is lower than the telephone survey. It will be up to the implementing consultant address this issue and insure appropriate interview practices.

Telephone Interview Methodology for 24-Hour Recall Survey

Concerns arose at the negotiated rule-making committee over the ability of respondents to correctly recall the amount of food consumed over the phone using verbal cues.²⁰ The Casey study developed a telephone survey data set to compare with the CSFII data set generated from in-person surveys. This comparative analysis concluded that the telephone method was feasible and produced results similar to in-person interviews. There were four food groups where the telephone survey over reported consumption as compared to the CSFII²¹ data set and their results were consistent with four other studies.

Florida conducted a food recall survey by telephone in 1994.²² The Florida study is similar in a number of aspects to the proposed IDEQ survey. They used a combination of telephone and in-person interviews. The state sample was 8,000 households and stratified by county. The study was able to gather information on 15,672 individuals using households as the survey unit. The study also pulled a 500 in-person sample that primarily targeted low-income populations. The telephone interviews used familiar food-related items such as a slice of bread and an 8-ounce beverage cup.

The rationale for using the telephone approach was its low cost and probability sampling. It also cited the EPA's support for using telephone surveys for data collection. The team used a 7-day recall period citing a number of studies that found the 7-day recall did create recall of omission but felt that aided recall diminished this bias. The team also cites a number of studies that using a "standard" portion may result in systematic underreporting. As an alternative to a single portion size, the study offered a range of sizes to introduce individual variability. The study goes on to assert that recall on solid foods is more accurate than amorphous items. This may be true, however, Casey indicates there may still be a

²⁰ See Casey et al.

²¹ Continuing Survey of Food Intakes by Individuals, USDA

²² See Degner et al.

systematic bias in meat recall. The respondents were asked to imagine one slice of bread and asked to provide an estimate in fractions or multiples of bread to visualize the portion consumed.

This is a continuing discussion issue with surveys. Researchers recognize that surveys do not precisely reflect the “true” consumption patterns, which is why standard deviations, confidence intervals, and description of the error patterns are provided. The calculated means will provide the more probable than not answer for fish consumption and the statistics describe the variation around the mean.

DEFINITIONS

Operational definitions are the specific boundaries of the target population. Recordkeeping often does not align with the research question. It is in these grey areas that professional judgment is required to define these edges. An illustration of this issue is in the definition of an Idaho angler. Decisions have to be made as to whether this includes non-residents or Idaho residents only. This section is intended to provide insight and definitions of the terms used in developing the survey sample.

Fish Consumer

The definition of who may be a fish consumer may impact the shape of the distribution function, the magnitude of the mean consumption amount, and the choice of statistical analysis. For example, if the NCI method is used, an internal assumption of the model is that all respondents are fish consumers. There is no right answer to this question. Instead, as long as the report is transparent and makes the reader aware of the possible bias, it is sufficient. PPC recommends that the questionnaire ask the individual whether they have eaten fish within the last 12 months. Depending upon the analytic method chosen, this should provide sufficient information to classify the respondent. If an individual responds negatively to the last 12-month consumption question, the interviewer is recommended to prompt with a series of additional questions to ensure that the recall is valid. The 2007 and 2012 BRFFS study indicated that 90 percent of Idaho residents consume fish at least once a year, suggesting that there are few never consumers.

Non-Fish Consumer

The issue of under or over-reporting the non-consuming population impacts the shape of the distribution function. This issue continues to be discussed in the literature of how to account for this potential measurement error. IDEQ presented the rule-making committee with a graphical depiction of over-reporting never fish consumers. The impact of including non-consumers in the analysis is that it skews the distribution curve by reducing the mean. It will not impact the number of high consumption consumers but may have the potential of moving the lower confidence boundary lower. The potential of the error shifting the 90th or 95th percentile mean significantly is remote, however, once the data is collected, it should be tested to determine whether the never eaters in the survey are consistent with the BRFFS data and adjusted if necessary.

Idaho Recreational Angler

There are a number of considerations in defining an Idaho recreational angler. The first consideration is whether to include residents of Border States who hold an out-of-state Idaho license. The second consideration is how to accommodate the various combination licenses. Third, can a holder of a fish license be considered a never fish eater? PPC recommends that if the resident has had an Idaho fishing license²³ within the last 18 months they be considered an Idaho angler. The 18 month recommendation is a consequence that fishing licenses expire on December 31st of the year they were purchased. Due to the high waters from spring runoff and the date of opening of general season many

²³ See Appendix F for complete listing of fishing license options that are part of the target population.

people do not renew their licenses until late May of the following year. This means that if you restrict to 12 months you may miss a large segment of the Idaho angling population.

If the license is for an out-of-state non-resident, there is no evidence that these out-of-state anglers will have a substantially different consumption pattern than Idaho residents. PPC recommends that they be considered a non-Idaho resident and excluded from the sample base.

There are a number of different packages that include a fishing license. It is possible to have Idahoans who have a current fishing license but do not fish. PPC recommends that any holder of an Idaho resident fishing license be considered an angler. There is no evidence to support the alternative assumption.

Many Idaho anglers renew their fishing licenses in May of each year. The Idaho fishing license expires at the end of the calendar year. Thus, there are a number of Idaho anglers who will not have a current license for part of the year. An eighteen-month window will allow anglers to be included who traditionally purchase an Idaho fishing license in May-June of each year.

Youth anglers, under age 18, are allowed to fish without a license if accompanied by an adult. There are ethical issues that restrict interviewing youths. PPC recommends that youth anglers be excluded from the survey.

There is concern about poaching. People who engage in this activity may be high-consumption anglers, but hard to identify. In discussion with IDFG²⁴ they have a high degree of confidence that individuals who regularly fish will have a license. The compliance officers are regularly on the waters, therefore the probability of being cited for poaching is high. It is simply less expensive to purchase a license than fish without a license. It is noteworthy that Idaho requires a license for all game or nongame fish in Idaho. This contrasts with states that adjoin saltwater that allow fishing without a license. Additionally, people who catch and consume non-game fish generally do not wish to throw back game fish if caught, again incentivizing the purchase of a fishing license.

Idaho Resident

Defining an Idaho resident is relatively straightforward, and will be deemed as such if they are living at an Idaho address. It is possible however that someone living at an Idaho address is a permanent resident of another state. Additionally, this definition will not capture respondents who live adjacent to Idaho but regularly take fish from Idaho waters. There is no evidence that the inclusion or exclusion of these subpopulations will have any measurable impact on the statewide fish consumption rate.

Minority Populations

The question was raised as to whether or not minority populations may consume fish at a higher rate than the majority population. The concern is that the sample design may not adequately represent this group. This concern is heightened with the fear that the minority population may also be low income or transient, therefore hard to reach with traditional survey methods. The 2012 BRFFS data does not suggest that this is the case in Idaho. An individual, regardless of ethnicity, who consumes Idaho fish will have a high probability of having a fishing license and will be captured in this subpopulation. PPC recommends that, if this remains a concern, after the data is collected to compare the ethnicity of the sample with the census data and adjust the weights if necessary. If the minority populations are believed to be underrepresented after the survey, there is the option of conducting direct outreach through homeless, food assistance, low income, and refuge organizations to identify whether a subpopulation is a high fish consumer.

²⁴ Personal communication with Mr. David Parrish with IDFG

Suppression Rates

Suppression rate for consuming fish caught in Idaho was discussed. Suppression rate is a phenomenon that occurs over time in response to a change in environmental conditions or social norms. In order to generate statistically significant data it will require a longitudinal analysis. Longitudinal studies are able to trend changes over time in relation to environmental or social variables. This survey is a cross-sectional survey design, which means it collects data at a point in time and cannot measure changes in consumption rate over time. However, this method of analysis is able to measure *perception* of changing consumption.

If a longitudinal study is desired, an ethnographic study of the Idaho residents should be conducted to identify the main drivers that impact consumption rates for Idaho fish. The Wabanaki²⁵ Tribe FCS dietary survey used this approach. This method provides a rich descriptive analysis of consumption patterns. However, these studies have trouble answering the question of how to mitigate the cultural responses to industrialization. A preliminary list that should be investigated to build a model of likely drivers should include:

- Population growth
- Cultural evolution
- Urbanization
- Limited shorelines
- News media
- Fish advisories
- Water quality
- Actual fish availability
- Education and understanding of fish consumption
- Climate change
- Internationalization of air quality

PPC recommends asking the suppression question as a positive and as a negative to verify for consistency. These questions will not be able to determine actual suppression rates, and PPC does not recommend they be included as a factor in evaluating “true” fish consumption rates.

Survey Respondent

In developing the sample, one of the early decisions that was made was the definition of the survey respondent, including consideration of how the respondent is to be reached, the geographical barriers, and the ability to get respondents to participate. There is a general agreement that using individuals as the survey units will be the easiest to operationalize. The alternative was to use households, which presented challenges for households with cell phone service, and collecting data about a household from one individual.

Total Dietary Intake

There was discussion of whether to obfuscate the purpose of the survey by couching the survey within a total dietary intake survey. The argument for using this approach is that respondent’s bias to the perceived purpose of the study may be muted. The disadvantage of using this approach is that it will increase the length of the survey and the cost of implementing it dramatically. PPC recommends that the interviewer is explicit that the purpose of the survey is to

²⁵ Dr. Barbara Harper and Professor Darren Ranco, PhD, July 9, 2009 Wabanaki Traditional Cultural Lifeways Exposure Scenario, Prepared for EPA in collaboration with the Maine Tribes by DABT, AESE, Inc. Environmental Studies and Native American Studies, Dartmouth College

measure Idahoans fish consumption. This will allow the interviewer to quickly identify non-fish consumers and move to the next sample.

Target Populations

There are two target populations identified for the IDEQ FCS. The first is all adult Idaho residents where adult is defined as a person 18 years of age or older. The second target population is adult Idaho residents who have held an Idaho resident fishing license within the last 18 months.

FISH CONSUMPTION SURVEY TECHNICAL GROUP

PPC was tasked to participate with the Coeur D'Alene tribe, Kalispell tribe, Kootenai tribe, Nez Perce tribe, Shoshone-Bannock tribe, Shoshone-Paiute tribe, CRITFC, Upper Columbia United Tribes (UCUT), Upper Snake River Tribes (USRT), EPA, Ridolfi and The Mountain-Whisper-Light (TMWL) team, and Ross Strategic to coordinate the Idaho state and tribal fish consumption rate surveys. This coordinated activity was referred to as the Fish Consumption Survey Technical Group. The goal of this group was to share what each survey team was learning about Idaho, discuss common issues surrounding each groups' mission, to the extent possible develop common core questions, and to share the results of each survey. The objective of this section of the draft report is to summarize these coordinated efforts and identify the major issues and decisions that were discussed in a collaborative manner.

To date, there have been three phone conferences held on July 11, July 24, and September 9, 2013. These meetings have primarily focused on two areas. The first area was to provide guidance on creating comparability between the two initiatives. The second area included sample design issues of episodic food consumption with specific focus on the challenges presented with the NCI method.²⁶ In addition to the scheduled phone conferences, there have been phone conferences between the two teams and the NCI researchers as well as significant email correspondence.

Coding

It was discussed how to coordinate the common core questions with a standardized coding method, and the issue was deemed premature.

Common Core Data Elements

The group identified a number of common core data elements: types of fish consumed, where fish were caught/sourced, and basic demographic information for survey respondents. The group acknowledged that the Idaho tribes likely will ask more detailed questions related to individual fish species (because of the use of personal interviews), but that this data could be aggregated into the same groups IDEQ uses for purposes of comparison through data coding. The group also discussed that the proper measure for the amount of fish consumed is grams per day.

Consumption Suppression

Whether consumption suppression exists and why consumption may have changed over time was raised. This issue may be of much higher significance to tribes for a number of reasons than for the general Idaho population. It was decided they would address this issue separately with their clients.

Fish and Shellfish Classification

The group discussed how the survey could classify fish and shellfish. The IDFG Fisheries Bureau has been surveying anglers about fishing preferences from 1968 through 2011. The purpose of these surveys is for management of

²⁶ Ken Ghalambor, Ross Strategic, Draft summary of technical survey design team phone conferences

sustainable fisheries. The sample of license holders was about 16,000, and the agency received 5,600 completed surveys. The IDFG used the following categories for its fisheries.

Question 1: What type of fish did anglers fish for (occasionally or often)?

1. Trout (93%)
2. Anything that bites (68%)
3. Bass (59%)
4. Bluegill/perch/crappie (50%)
5. Steelhead (42%)
6. Kokanee (36%)
7. Catfish (33%)
8. Chinook salmon (26%)
9. Whitefish (18%)

While IDFG is trying to determine which fish anglers most often target, IDEQ is interested in the fish that are consumed by Idahoans. There is an overlap between the two agencies. It is recognized that the overlapping interests are not perfect and will likely result in IDEQ classifying fish and shellfish differently than IDFG. For example, incidental and nongame fish harvest may play a significant role in the actual consumption of fish but may not be a significant factor in the management of game fisheries. The IDFG survey results suggest that anglers primarily fish for trout but most are interested in catching a wide variety of fish. Since the goal of IDEQ is consumption, fish should be categorized to allow the interviewer to select the appropriate basis of comparison to assess the quantity of fish consumed.

Minority Populations

EPA asked the group to consider how they might reach non-English speakers or low-income populations that may not have access to a telephone or Internet and may be high fish consumers. This issue was extensively addressed with the group and in the August negotiated rule-making committee. The group decided that they would address this issue separately with their clients.

NCI Method Implementation

A considerable amount of time was spent discussing how to increase the probability of having one respondent answer in the affirmative on two 24-hour recall surveys. It was discussed that one could include only the high consumption respondents from the first 24-hour survey for the second survey. Because of the positive correlation between frequency and amount per consuming episode, there should be a higher expected yield of recall survey. It was determined that this may introduce a systematic bias and a straight application of this principle was rejected.

The question arose whether the current SAS version includes a provision for fewer than 100% of respondents having a second day 24-hour report. When TMWL previously ran the SAS software, those without a second day were dropped. NCI responded that the current available software can handle different people having different numbers of recalls, such as people surveyed three times, some surveyed twice and some only once. The second version of the NCI program will be available soon.

The adaptability of the NCI software to a single episodic food intake model like fish was discussed. With a single food, there exists a significant probability that never consumers occur more frequently than in a dietary food survey in which multiple foodstuffs are included. NCI informed the group that the current version of the NCI software for SAS now includes the feature of estimating the percentage of true non-consumers in the population. This should reduce the issue of misreporting never consumers.

The group wanted to know specifically how the software treats ever and never consumer statistics. The never consumers piece is handled by a third version of the methodology, which uses Markov Chain Monte Carlo (MCMC) methods instead of likelihood methods to fit the models. The MCMC can model the probability of being a never consumer based on the FFQ, as was described in the 2009 Kipnis et al. *Biometrics* paper. NCI tried modeling fish with never consumers in that paper as well, but the likelihood methods were unstable with only two recalls per person. The likelihood method works well when there are four recalls per person. The MCMC is more stable, and works fine with two recalls. The Keogh and White methodology uses stronger assumptions so that they can use a likelihood method. The MCMC (and the likelihood) presents distributions and significant errors of the total population as well as the population excluding never consumers. The MCMC software is coming soon (waiting on the user guide). NCI anticipates being an active participant in this project and will make the software available to the teams ahead of the release to the general public.

Respondents Weight

A consensus was reached that including a question on weight is good information for risk assessment and creates an additional data point on which to compare different data points. It was recognized that this information is currently not necessary for the fish consumption survey.

Shared Goals for Survey Coordination

The group identified a number of goals that both surveys should strive to meet:

- Develop a core set of data that can be aggregated and compared in the future, based on core questions that can be common to all surveys.
- Recognize that questions may be different depending on the target population (e.g., a general population as compared to a recreational angler).
- Strive for a consistent statistical methodology across all surveys.
- Ensure consistent timing between survey efforts.

The group acknowledged that there may be differences among surveys and did not believe that this would prohibit the comparability of the results. The group discussed how the data would be categorized so that the break points will align between the two projects.

Statistical Inference

The group discussed a number of issues regarding how to minimize systematic error and provide the best estimation of fish consumption. Episodic consumption is a challenge because of recall issues and respondent bias. The group recognized that the precision for a mean or median of the total population will likely be much better than that for higher percentiles (e.g., 90th).

The group also discussed that while a larger sample size is desirable, obtaining a large sample size may be challenging given resource constraints. TMWL presented three sample populations that follow a lognormal distribution for fish consumption rates. Their examples show that as sample size increases, the variance around the true value (for mean, median, 90th, 95th percentile) decreases. It was also discussed that this issue will be more prevalent if IDEQ desires means for sub-groups for specific fish species. The group also discussed that having a large variance around the observed value of an estimate (margin of error) does not mean that each value is equally likely to occur, i.e., the margin of error is important to consider but the observed value is much more likely.

A more substantive discussion occurred with Drs. Subar and Dodd over the possible introduction of systematic error through how the NCI method treats never consumers as ever consumers. Considerable time was spent discussing how

the software will handle episodic consumption patterns where not all the target population eats the target food. Dr. Dodd expressed optimism that version two of the SAS application will soon be available to adjust for never eaters. IDEQ is interested in knowing if seasonality of consumption exists. If there is not a covariate, then the seasonal effect will be folded into the between-person variance. And, the distribution of "true" intake rates will be broadened and percentiles will be biased. It was suggested that one method to address this would be to put in season as a covariate, a categorical variable represented by dummy variables. That would generate one distribution per season, which we could then recombine with some weighting according to the duration of each season. NCI believes the current software has the ability to incorporate a seasonal covariate. It will take some programming to make sure a suite of programs is in place that data can be dropped into and then the results retrieved.

Survey Methodology

The group discussed whether it would be important for the IDEQ and tribal surveys to share the same overall survey methodology. It was concluded at the July 24th phone conference that PPC and the tribal survey design team would likely pursue different methodologies. Both groups are still considering collecting information that can be used with the NCI method as well as FFQ. The group recognized that each methodology has particular strengths and weaknesses, and each can create accurate results as long as the method is rigorously applied. Additionally, if the core questions are asked in the same manner then the responses will be comparable between surveys.

Survey Respondents

There was discussion on whether information would be collected for individuals or household units or both. It was determined that individual should be the survey unit. The tribal survey will be using individuals as they intend to use in-person interviews. This method will allow for a more in-depth understanding of whether or not fish suppression may be occurring and the reasons why. The data collected from the two methods will be comparable.

Unlicensed Anglers

The group discussed how to treat unlicensed recreational anglers. PPC relayed their conversations with IDFG that all anglers (except for tribal members) need a license to fish legally in Idaho. And IDFG has found that few regular recreational fishers fail to obtain a license. IDFG simply does not consider this to be a substantive issue.²⁷

²⁷ David Parrish with the IDF&G personal correspondence of December 6, 2013

SAMPLE DESIGN

At the end of the day, budgets often govern the sample size. The ideal is to survey every person of interest. At this point, we know the population value and don't have to estimate it. For everything short of this we rely on inferential statistics to approximate the true population parameters. Statistics allow us to sample a relatively small portion of the population and determine the characteristics of that population.

We express our estimates in terms of confidence intervals and confidence levels. Following a survey, with data in hand, we can calculate precisely the probability that an estimate of the range within which the population parameter falls is in error. Sound estimates of proportions (e.g., the percentage of Idahoans who consume Idaho fish) can be made with little prior data. For most applications, samples of 800 are more than adequate. With population data from a previous survey, it can be anticipated with some accuracy the sample size required to produce the desired confidence interval at an established confidence level for other population parameters (e.g. average consumptions, or consumption at the median or any other percentile). Absent such data, assumptions must be made about the nature of the population distribution.

Sampling from a Log Normal Distribution

The deviation of estimated and true values increases when the data collected does not behave in certain well-established ways. As the data deviates from established norms, the statistician increases the sample size to maintain a level of accuracy.

There have been a number of articles on the shape of the distribution curve for fish consumption.²⁸ The Ruffle article points out a number of the foundations for assuming a log normal distribution. Under a log normal distribution assumption, the minimum required sample increases. The sample also assumes that the relationship between saltwater fish and fresh water fish consumption correlates positively and proportionately. The literature review implies that, for a log normal, skewed distribution, that approximately 2,000 completed surveys will be necessary for the total Idaho population. If the assumption that recreational anglers are more likely to consume fish, it may be possible to have fewer surveys for Idaho anglers.

NCI Method

The sample design was structured for the data requirements of two statistical models -- the never episodic consumer (NEC) model and the National Cancer Institute (NCI) ever episodic consumer model. At issue is the potential for significant measurement error in episodic consumption data. In the field of nutritional epidemiology, there is not a "gold standard" for measurements. There is a consensus that short of having respondents rigorously maintain a daily diary over the course of a year, using a short recall period will minimize the measurement error for a single event. Of the two, the NCI method has a statistical requirement that will impact sample size significantly.

The National Cancer Institute (NCI) method was developed to measure episodic consumption of food items.²⁹ The issue the method was trying to solve was how to get accurate consumption profiles of the amounts of dietary items of interest when they are episodically consumed. Due to the unreliability of human recall, researchers generally agree that

²⁸ Ruffle, Betsy, David E. Burmaster, Paul Anderson, and Henry Gordon, "Lognormal Distributions for Fish Consumption by the General US. Population, 1994, Risk Analysis, Vol. 14, No 4, pp395-404

²⁹ Tooze, Janet A., PhD, M.P.H.; Douglas Midthune, Ms.; Kevin W. Dodd, PhD; Laurence S. Freedman, PhD; Susan M. Krebs-Smith, PhD, M.P.H., Rd; Amy F. Subar, PhD, M.P.H., Rd; Patricia M. Guenther, PhD, Rd; Raymond J. Carroll, PhD; Victor Kipnis, PhD, 2006, "A New Statistical Method for Estimating the Usual Intake of Episodically Consumed Foods with Application to Their Distribution", Journal of the American Dietetic Association, Vol. 106, No 10, pp1575-1587.

the shorter the recall time frame the more accurate the response, assuming other researcher and respondent biases being equal. However, episodic consumption means there is a high probability that a survey with a short recall period will underreport the episodic consumption. Samples of this type of data have trouble distinguishing day-to-day variation of an individual's consumption within-person, the variation of consumption patterns between people, and between-person. The NCI method assumes that within-person variance is constant across consumption amounts based on two or more surveys of a single respondent. Then, the NCI method uses probabilistic assumptions to fill in the density distribution. It will be necessary to have at least 50 respondents report consumption during two surveys to use the NCI method.

Idaho Population Sample

In assessing Idaho fish consumption, the first challenge occurs in collecting a second, potentially rare, event from the same person to develop a within-person variance. This is required to establish the mean consumption amount for one individual, potentially increasing sample size. The second challenge occurs in determining who are true never fish eaters. The introduction of never eaters into the data set will shift the mean and shape of the distribution of ever eaters. We know never eaters exist, macrobiotic vegetarians are one example. The solution to this challenge is both within the questionnaire target population definitions, the sample design, and the survey methodology. This section addresses the required sample design necessary to provide sufficient observations for minimizing the measurement error.

With a relatively infrequent event twice responders will be rare. In the end this has driven sample size recommendation. First, if a respondent never consumes fish, they are removed from the pool of potential twice consumers. According to national data, this excludes half of the respondents.

Assuming that 50 percent of the population are never consumers, if 20 percent eat fish during a recall period, it would be expected 4 percent (0.20×0.20) of the fish consumers sampled (i.e., 2 percent of the population) to be twice-consumers. Thus a sample of 2500 would yield 50 twice consumers, sufficient to satisfy the requirements of the NCI method.

But if only 5 percent of the ever consumers eat fish on any given day, we would expect only 0.25 percent (0.05×0.05) of the fish consumers sampled to be twice consumers (and so only 0.125 percent of the population as a whole). Thus a sample of 5000 would yield only 6 or 7 respondents, insufficient for the requirements of the NCI method (a sample of 40,000 would be required). This is based on the conservative assumption that the likelihood of a positive response on the first contact has no correlation to the likelihood on the second contact. PPC believes that this may be overly conservative.

Dresser found that 56 percent of the population eat fish once during a week, and that approximately 1.3 percent of total population consumes fish on any one day.³⁰ In addition, the Ruffle article indicates that of the total fish consumption of freshwater finfish only account for about 8 percent of the total fish consumption. This assumption may not be relevant for Idahoans. If these patterns hold for Idaho, a 24-hour recall is unachievable within budget, and IDEQ will have to rely upon a 7-day recalls.

However, the 2012 CDC BFRSS survey³¹ offers insight into the frequency of Idahoan fish consumption, places it significantly higher than the national average, and provides room for optimism. The study suggests that approximately

³⁰ Dresser, Connie M Villa, "Food Consumption Profiles of White and Black Persons Aged 1-74, US Department of Health Education and Welfare, 1979, Publication No. (PHS) 79-1658

³¹ Idaho Central District Health provided the conclusions from the 2007 survey.

80 percent of Idahoans consume fish monthly, and that Idaho fish consumers may exceed 90 percent of the Idaho population (figures for daily and weekly consumption are not provided). 50 24-hour twice consumers of all fish and shellfish with a sample of 5000 should be easily identified, and there is some hope a sample of that size may capture the 50 24-hour repeat consumers of Idaho fish required for NCI. If forced to revert to a 7-day recall (and the Florida study and others suggest that with infrequently or routinely consumed items 7-day is about as unbiased as a 24-hour recall), 5000 samples should be more than sufficient (pilot testing and early completions will serve to validate these assumptions).

Angler Sample

In addition, IDEQ seeks to identify the consumption of Idaho fish by anglers – the approximately 430,000 of Idahoans who purchase a fishing license. This group represents about 30 percent of the total Idaho population. As a result, the size of this sample can be considerably smaller since we would expect a higher rate of consumption of Idaho fish, with fewer never-consumers than the general population. We also are advantaged by a sound sampling frame and some prior data.

Assuming that 25 percent of anglers are never consumers, if 20 percent of the remainder eat fish during a recall period, we would expect 4 percent (0.20×0.20) of the fish consumers sampled, 3 percent of the population, to be twice-consumers. Thus a sample of 2000 would yield 60 twice consumers, sufficient to satisfy the requirements of the NCI method. We believe a sample of 2000 anglers will capture sufficient 7-day recalls to employ NCI, and may well provide sufficient 24-hour recalls.

Minimizing Sample Size

It is difficult to estimate the number of recalls that will occur. PPC recommends the first survey use the higher end of the sample draw. The completed surveys should be analyzed on the number of individuals who answered in the affirmative to recalculate the estimate necessary to meet the minimum completed survey constraint. The first survey may over or under sample the target population.

Recommended Sample Size

At the end of the day there are two values of particular interest. The first is the consumption value at the upper end of the distributions for both samples. The second is the density function for the two populations. 5,000 completed samples have a good possibility of achieving adequate number of two recalls. It does not answer the question of whether the completed surveys will produce sufficient surveys to determine the upper percentiles with relatively close confidence intervals. It is anticipated that the tribal surveys will produce a profile of high-end consumption. The question posed to PPC is if the tribal surveys are not available to IDEQ will the proposed sample size produce sufficient completed surveys?

The Ruffle article³² provides a starting point for producing an estimate of completed surveys at the 90th and 95% percentile. The article used several different models to determine the shape of the consumption distribution of fish. The following table is an excerpt from the Ruffle article for adults only and two strata nationwide and mountain region (CO, ID, MT, NM, NV, UT, and WY). The article does discuss that much of this data is dated and that U. S. citizens' consumption of fish has been increasing. What the article does provide is a mean and standard deviation estimate that can be used to run a simulated lognormal distribution based on these values.

³² Ruffle, Betsy, David E. Burmaster, Paul Anderson, and Henry Gordon, "Lognormal Distributions for Fish Consumption by the General U.S. Population, 1994, Risk Analysis, Vol. 14, No 4

Table 1: Log Normal Distributions Fit by a Non Linear Optimization Method (Ruffle et al.).

Nationwide								
Saltwater				Freshwater				
Grams per day	50 th	90 th	Average	50 th	90 th	Average		
μ	2.311	7.29	23.73	10.68	0.334	0	5.12	1.48
σ	0.72			1.183				
Mountain Region								
μ	2.045	6.58	19.59	8.9	0.379	0	5.07	1.48
σ	0.716			1.182				

The following table is the result of a simulation of a lognormal distribution using the mountain region saltwater finfish. A number of other simulations were run for a sensitivity analysis. There were no surprises. The variance will increase as the standard deviation increases. If $\sigma = 1$ the top 1% variance will increase from 9% to 19%. The top 5 % will increase from 41% to 57%. It is important to understand that the grams per day are not relevant in this example. Rather it is the percent variance within percentile. A sample of 5,000 completed surveys will produce 50 surveys in the top 1 percentile. What is unknown will be the variance of consumption within the top one percent. If assumed it will be similar to mountain region consumption of saltwater finfish (PPC suggests saltwater data, because there may be issues with freshwater fish statistics because of wide variation within the mountain region), there will be a 9 percent variance in the estimated daily consumption rate. If the standard deviation is increased to one the variance will increase by 10 percent. This will be the challenge for IDEQ.

Table 2: Simulated Random Generator.

Percentile	Top	N	g\day	Variance	Difference	Mean	Variance
99%	1%	50	29.1	32	2.9	30.55	9%
95%	5%	250	21.2	32	10.8	26.6	41%
90%	10%	500	17.5	32	14.5	24.75	59%
Median	50%	2500	6.4	7.7	1.3	7.05	18%
Mean	100%	5000	9.4	9.4	0	9.4	0%

There is no way before actually drawing a test sample of several hundred respondents to determine what the distribution will look like. It may be that to reduce the variance of the 95th percentile that a quota may have to be established.

QUESTIONNAIRE

The goal of the questionnaire is to collect statistically valid information on Idahoans’ consumption frequency and quantity of fish or shellfish. Additionally, the questionnaire seeks to identify whether the fish or shellfish consumed lived in Idaho waters, and how the food was prepared. The questionnaire queries Idahoans’ perception of whether their current consumption is different than their past consumption or their desired consumption. Finally, the questionnaire seeks to identify five demographic profiles to assist IDEQ in understanding who is eating fish and shellfish.

Demographics

The collection of demographic profiles allows for comparisons through cross tabulations between the demographic and fish consumption questions. There were a number of conjectures made during the negotiated rule making committee meetings, for instance that the consumption of self-caught fish may be inversely related to income. Inserting demographic questions will provide some indication whether these are factors that can be used for Idaho fish consumption patterns. It is not proposed to stratify the sample due to the limited demographic data statistical significance.

Fewer demographic categories mean a shorter survey which increases the probability of it being completed. The demographic questions included have been vetted with the Fish Consumption Survey Technical group. PPC recommends that the following five demographic characteristics to be included in the survey.

1. Gender
2. Age
3. Income
4. Education
5. Ethnicity
6. Weight

Questionnaire Introduction

The introduction of the questionnaire is important in setting the stage for the respondent. It is recommended by PPC that the introduction chosen by the implementing consultant be clear on the purpose of the survey and how the data will be used. This will reduce respondent bias and increase the integrity of the results. Each survey consultant will have a standard protocol they will follow and PPC has provided an example for the firm to consider.

Gender Proportionality

To gain an accurate understanding of fish consumption rates, the questionnaire needs to know gender at the beginning of the survey. If gender balance is not sought, it is possible that one gender will be significantly over/under reported. The BRFFS data does show that fish consumption between genders is different for Idaho caught fish. The time of day that the surveys are given will affect the gender balance. PPC recommends that IDEQ discuss with the survey consultant appropriate scheduling of the calls. If the sample ratio is close to the target population, the data can be statistically adjusted to match the target population.

Table 3: 2010 Census Bureau statistics on national and state populations.

Subject	United States ³³				Idaho			
	Estimate	Margin of Error	Percent	Percent Margin of Error	Estimate	Margin of Error	Percent	Percent Margin of Error
SEX AND AGE								
Total population	306,603,772	*****	306,603,772	(X)	1,549,987	*****	1,549,987	(X)
Male	150,740,216	+/-6,945	49.2%	+/-0.1	776,969	+/-669	50.1%	+/-0.1
Female	155,863,556	+/-6,948	50.8%	+/-0.1	773,018	+/-669	49.9%	+/-0.1
Under 5 years	20,170,377	+/-3,883	6.6%	+/-0.1	120,039	+/-288	7.7%	+/-0.1
Median age (years)	37.0	+/-0.1	(X)	(X)	34.5	+/-0.1	(X)	(X)
18 years and over	232,556,019	+/-7,320	75.8%	+/-0.1	1,126,153	+/-337	72.7%	+/-0.1
21 years and over	218,867,711	+/-23,239	71.4%	+/-0.1	1,058,753	+/-1,294	68.3%	+/-0.1
62 years and over	48,777,496	+/-21,092	15.9%	+/-0.1	234,540	+/-1,439	15.1%	+/-0.1
65 years and over	39,608,820	+/-4,840	12.9%	+/-0.1	189,603	+/-355	12.2%	+/-0.1

³³ US Census Bureau, 2010 census, last accessed July 15, 2013, <http://www.census.gov/2010census/>

Age Scale

PPC recommends that the question asking a respondent's age be asked open-ended. However, this does not mean that the responses will be accurate. People will misrepresent their age for a variety of reasons. In looking at the Idaho age cohorts, approximately 60 percent of the population is age 18 to 64, 12 percent are 65 and over, and 27 percent are under 18. There are ethical issues interviewing people under 18 that will have to be covered with the implementing consultant, and it is recommended the survey solicit responses from adults only.

Income Scale

It has been suggested by some on the negotiated rule-making committee that disposable income is a predictor of the amount of wild caught fish consumed. In Idaho, this link may not be as strong as coastal areas of the country where households have greater access to fish year round. However, the ability to freeze and store fish may mitigate the seasonality allowing year round consumption. By asking the income question, it will insure that the data set will proportionately represent the income demographic for Idaho. And, like gender, if it is found that some adjustments need to be made, the under or over represented groups may be statistically weighted to balance the data set. The median income for Idaho is \$46,000 suggesting a natural break above and below the median income with allowance for the very poor and very rich designation to allow IDEQ to investigate this concern. It is recommended that the solicitation of household income is open-ended and the responses are coded into six categories: Less than \$15,000, two categories less than the median income, two categories above the median income and respondents with income over \$100,000.

Table 4: 2010 US Census INCOME AND BENEFITS (IN 2011 INFLATION-ADJUSTED DOLLARS).

Subject	United States				Idaho			
	Estimate	Margin of Error	Percent	Percent of Margin of Error	Estimate	Margin of Error	Percent	Percent of Margin of Error
Total Households	114,761,359	+/-251,732	100%	(X)	575,497	+/-2,256	100%	(X)
Less than \$10,000	8,176,081	+/-21,386	7.1%	+/-0.1	37,121	+/-1,402	6.5%	+/-0.2
\$10,000 to \$14,999	6,248,397	+/-20,005	5.4%	+/-0.1	33,657	+/-1,108	5.8%	+/-0.2
\$15,000 to \$24,999	12,217,054	+/-23,671	10.6%	+/-0.1	67,869	+/-1,806	11.8%	+/-0.3
\$25,000 to \$34,999	11,944,165	+/-23,888	10.4%	+/-0.1	73,688	+/-1,963	12.8%	+/-0.3
\$35,000 to \$49,999	15,874,513	+/-27,329	13.8%	+/-0.1	91,545	+/-1,940	15.9%	+/-0.3
\$50,000 to \$74,999	21,057,656	+/-45,503	18.3%	+/-0.1	119,418	+/-2,016	20.8%	+/-0.4
\$75,000 to \$99,999	14,181,160	+/-60,815	12.4%	+/-0.1	68,945	+/-1,522	12.0%	+/-0.3
\$100,000 to \$149,999	14,551,369	+/-71,451	12.7%	+/-0.1	55,683	+/-1,374	9.7%	+/-0.2
\$150,000 to \$199,999	5,354,595	+/-34,224	4.7%	+/-0.1	14,861	+/-671	2.6%	+/-0.1
\$200,000 or more	5,156,369	+/-31,033	4.5%	+/-0.1	12,710	+/-691	2.2%	+/-0.1
Median household income (dollars)	52,762	+/-99	(X)	(X)	46,890	+/-381	(X)	(X)
Mean household income (dollars)	72,555	+/-125	(X)	(X)	60,274	+/-488	(X)	(X)

Education Attainment

Some on the negotiated rule-making committee suggested that FCR may be correlated to education. IDEQ requested that a question be added with an accompanying table. The table illustrates that Idaho profiles along with the United States total population averages with the exception of post-secondary degrees.

Table 5: U.S. Census, American Community Survey, 2012.

	United States		Idaho	
	Estimate	Percent	Estimate	Percent
Educational Attainment				
Population 25 years and over	208,731,498		1,012,786	
Less than 9th grade	12,072,306	5.8%	41,438	4.1%
9th to 12th grade, no diploma	16,409,962	7.9%	61,919	6.1%
High school graduate (or GED)	58,495,661	28.0%	280,462	27.7%
Some college, no degree	44,399,937	21.3%	279,779	27.6%
Associate's degree	16,611,110	8.0%	91,295	9.0%
Bachelor's degree	37,969,084	18.2%	175,020	17.3%
Graduate or professional degree	22,773,438	10.9%	82,873	8.2%

Ethnic Classification

In the United States, 74 percent of the total population report that their ethnicity is white. In Idaho, approximately 88 percent of the population report their ethnicity is white. This leaves 12 percent for all other ethnic groupings. Both the United States and Idaho report that 98 percent report single ethnicity, however, PPC recommends the ethnicity question allow for multiple ethnicity responses.

Minority races may be difficult to reach. Twelve percent of the US population self-report as Black or African American, but approximately ½ of 1 percent report this ethnicity in Idaho. And, 4.7 percent of the US population self-report as Asian American as compared to only 1.2 percent of the Idaho population. The largest non-white population in the US is Hispanic or Latino and the majority of Hispanics self-report as Mexican. Again, as with other ethnic groupings, Hispanics represent a smaller portion of total Idaho population and may be difficult to capture in a random sample without increasing the sample size. If these ethnic groups have a higher proportion of high consumers of Idaho caught fish, their likelihood of being captured in the recreational angler target population increases.

As with the other demographic questions, PPC recommends that an open-ended approach be used for the question. Five classifications of ethnicity are recommended: White Caucasian, Hispanic, Asian or Pacific Islander, Black or African American, and Native American/Alaskan Native.

If IDEQ desires, a follow-up question may be added for respondents who answer that they are Native American to identify if they belong to an Idaho tribe. A sample question has been added to the questionnaire.

Table 6: 2010 US Census Population Demographics Ethnic Identification.

Subject	United States				Idaho			
	Estimate	Margin of Error	Percent	Percent Margin of Error	Estimate	Margin of Error	Percent	Percent Margin of Error
SEX AND AGE								
Total population	306,603,772	*****	100%	(X)	1,549,987	*****	100%	(X)
RACE								
Total population	306,603,772	*****	100%	(X)	1,549,987	*****	100%	(X)
One race	298,787,118	+/-76,605	97.5%	+/-0.1	1,512,039	+/-1,433	97.6%	+/-0.1
Two or more races	7,816,654	+/-76,565	2.5%	+/-0.1	37,948	+/-1,433	2.4%	+/-0.1
One race	298,787,118	+/-76,605	97.5%	+/-0.1	1,512,039	+/-1,433	97.6%	+/-0.1
White	227,167,013	+/-53,436	74.1%	+/-0.1	1,431,372	+/-2,468	92.3%	+/-0.2
Black or African American	38,395,857	+/-22,583	12.5%	+/-0.1	8,823	+/-594	0.6%	+/-0.1
American Indian and Alaska Native	2,502,653	+/-13,628	0.8%	+/-0.1	19,584	+/-1,034	1.3%	+/-0.1
Asian	14,497,185	+/-19,761	4.7%	+/-0.1	18,714	+/-775	1.2%	+/-0.1
Native Hawaiian and Other Pacific Islander	500,592	+/-4,731	0.2%	+/-0.1	2,425	+/-349	0.2%	+/-0.1
Some other race	15,723,818	+/-82,860	5.1%	+/-0.1	31,121	+/-2,072	2.0%	+/-0.1
Hispanic or Latino (of any race)	49,215,563	+/-2,118	16.1%	+/-0.1	168,949	+/-59	10.9%	+/-0.1

Weight Scale

The question asking respondents their weight is recommended to be open ended. People will misrepresent their weight for a variety of reasons, and it is recommended that the reported ages are coded ranges. The median weight used by the EPA in calculating the grams per day per kilogram is approximately 155 pounds. This is a logical break point for the cohorts. PPC recommends that three groups be used for less than 155 pounds and three groups for over 155 pounds.

Fish and Shellfish Classification

PPC looked at a number of coding schemes used in other fish surveys to determine the different types of fish and shellfish that were included and how they classified the groupings. There was a difference between telephone surveys and in-person interviews. All the surveys reviewed included states with coastal waters. PPC took these surveys and created a coding scheme by logical groups for the most frequently caught Idaho fish, then by normal portion and density amounts, and finally by Idaho waters and other. Additionally, in consultation with IDFG and in response to their recommendations, the categorization process resulted in the Coding Table. The Coding Table is designed to achieve the dual goal of generating the information desired by the IDEQ and facilitate the screeners' charge to solicit quantity over the phone. There will be a number challenges presented by this method. One will be having the respondent accurately recall the species of fish. Another challenge will be getting the respondent to accurately estimate the quantity of seafood. There are two factors that will reduce the possible misclassification and miss estimate the quantity consumed.

By classifying fish by fillet size and steak cuts does not require the respondent to know the type of fish consumed. The second is that in weighting fish and shellfish there was little variation in density of flesh resulting in a similar weight.

While the question is open-ended and a respondent has the ability to identify the fish they consume, if they cannot the screener has a script to help the individual identify what they ate by size and cut. This naturally leads to which commonly recognizable item that matches the type of fish that the respondent indicated they consumed.

Table 7: Coding Table for Fish and Shellfish.

Code	Idaho Fish	Commercially Marketed Fish/Fish Products
A	All trout (rainbow, cutthroat, lake, brown, brook) and landlocked salmon (kokanee and Coho)	Trout (hatchery or pen raised)
B	Ocean-going Chinook (spring, summer, fall), steelhead, Coho	King, Chinook, steelhead, Coho
C	Crayfish	Crayfish, crab (Dungeness, Snow, King, etc.), lobster, shrimp
D	Whitefish, arctic grayling, and cisco	Smelt, Tilapia, Sole/Flounder, Mackerel, Herring, Anchovies
E	Bluegill, crappie, pumpkinseed, warmouth, perch, walleye, Muskie, pike, large and smallmouth bass	Bottom fish - cod, snapper, rockfish, bass, perch, walleye
F	Catfish, bullhead	Catfish
G	Nongame fish (carp, sucker, northern pike minnow, shiners, chisel mouth)	Nongame fish (carp, sucker, northern pike minnow, shiners, eel, chisel mouth, shiners, etc.)
H	Unknown	Unknown
I	All roe (eggs)	All roe (eggs, caviar)
J		Shark, swordfish, tuna, halibut, sturgeon
K	Freshwater mussels, clams	Mussels, clams (littleneck, soft shell, butter, cockles), snails
L		Oysters, geoduck, scallops, abalone
M		Octopus, squid, calamari
N		Sea urchin, sea cucumber, etc.

Portion Groupings

Codes A and D are most frequently consumed as a fillet. The size of the fillets is close to a typical checkbook. PPC recommends the survey use a checkbook as the scale for these codes. This is a decision that should be deferred to the implementation consultant to refine during the pretest phase. Codes B, E and H will use decks of cards, as these are most frequently consumed as steak or a portion of a fillet. Because of the density of these fish, the depth of the fillet approximates a standard deck of playing cards. It is recommended that a poker style deck of cards can be used as a scale. Again the final decision on what commonly recognized object that should be used should be left to the implementation consultant. Codes C, G, I, J, K, L, M, and O have the flesh pulled from the shell before consumption and a volume measurement is required. However, clams are often served in a 12-ounce bucket in shell. There are a number of code groupings to help the interviewer and respondent choose an appropriate representation of their amount of intake. PPC recommends that these codes will use cups or quarts. Finally, Codes F and N are open categories. It is anticipated that respondents will use F for soups, paellas and pizzas. For these types of foods, a precise method of determining the quantity consumed is not readily available and a surrogate portion will have to be assigned. There is not a recommendation for what the surrogate portions should be, but common recipes can be examined to determine the typical quantity of fish per serving if that level of detail becomes important. Appendix D provides examples of images that may be used to help an in-person interviewer or for an Internet survey.

Classification of Farmed Trout and Sea Run Trout

One of the grey areas in coding fish is market trout. Idaho is one of the prime suppliers of farm-raised trout. PPC recommends that the interviewer code all market purchased trout as Idaho trout.

Some rainbow trout will migrate to the ocean for part of their life cycle. For Idaho caught steelhead most anglers will know where they caught the fish, the time of year they caught the fish and know if it was a sea run trout. Additionally, because IDFG requires a steelhead tag anglers are aware when they are fishing for steelhead. IDFG categorizes rainbow trout exceeding 20 inches in length as a steelhead. This standard will be difficult to operationalize because there are landlocked rivers (i.e., dammed) preventing any fish from migrating. Since water source is beyond the scope of this study, PPC recommends that unless they specifically identify their catch as steelhead it is assumed to be a trout.

Food Frequency Questions

The food frequency questions, FFQ, have been used by risk assessment surveys. There is abundant literature discussion on the issues as they relate to episodic consumption. It is well known that people have difficulty recalling events the further in the past the event occurred. Additionally, there are many food preparation techniques that make it difficult to recognize the ingredients as fish or the quantity of fish in a serving. Finally, a number of fish or shellfish are not necessarily thought of as fish unless prompted. The goal of the FFQs seeks to identify if a respondent consumes fish and how often. The issue of ever or never fish consumer has implications for the statistical analysis used to generate the density function of fish consumption rates. The questionnaire is designed to query in such a way to prompt recall of eating fish and foods that are not normally associated with fish or shellfish. PPC recommends the questionnaire include a general question concerning episodic consumption followed up with prompts, if the answer is “no” to assist the respondents’ recall.

Based on this general question, if a respondent is a never eater then the interviewer will collect the demographic information on the respondent and terminate the survey. This will facilitate the interview process time. If the respondent is an ever eater then the interviewer will ask a series of questions that target consumption rates within a short window to increase the accuracy of recall. The recommendation is the survey ask about episodic consumption within a 24-hour recall period and within seven days but exclude the last 24-hour recall period.³⁴ These periods will also allow information to be collected on the quantity consumed whereas longer recall periods are less likely to produce the accurate portion size consumed.

Idaho Caught Fish

The questionnaire seeks to identify the water from which the fish were caught. The majority of finfish and shellfish sold at restaurants or at markets do not live in Idaho waters. There is one exception, trout. PPC recommends that all trout, regardless of how the respondent acquired the trout, be considered as grown in Idaho waters. For salmon and freshwater fish other than trout, the questionnaire seeks to identify how the fish were acquired and categorize the fish as Idaho caught, market or restaurant purchased or unknown.

Shellfish classification by water is also straightforward. There is only one shellfish that is commonly consumed that lives in Idaho waters, the crawfish. PPC recommends that unless the crawfish source can be identified as Idaho, crawfish be classified as non-Idaho.

Portion Size

³⁴Degner, R.L., Adams, C.M., Moss, S.D., Mack, S.K. 1994. *Per Capita Fish and Shellfish Consumption in Florida, Submitted to the Florida Department of Environmental Protection, in Fulfillment of Contract WM-476, University of Florida Digital Collections.*, PAGE 359, Accessed by web. <http://ufdc.ufl.edu/UF00027555/00001>

The survey seeks to identify the amount of fish consumed by grams. This is a significant challenge for a survey whether in-person interview or phone interview. People are visually able to make comparative analysis between ounces and grams with practice. The survey will be asking people to estimate portion size by a model, picture or common objects. Irrespective of the method chosen, an error will be introduced absent of actual observation of portions consumed. Fishmongers find that customers generally purchase between 6- and 8-ounce portions. This can be seen in local markets with the pre-cut fillets. A model at 6 ounces may look similar to an 8-ounce portion depending upon the density of the fish and the thickness of the steak or fillet. This is particularly problematic with recreationally caught fish. The preparer may not want to waste fish and serve larger portions than if purchasing fish at a store or vice versa. Finally, if the respondent consumed fish at a restaurant or in a stew, it will be very difficult to gain an accurate estimate unless the respondent is the meal preparer.

Recognizing these challenges, because the sample is random, it is probable that the over/under estimation will also vary, minimizing the introduction of systematic error. Additionally, the variation within person is likely to be consistent as people are likely to consume about the same portion of fish reducing the potential for the non-spherical disturbance term. These observations imply that the mean portion sizes by percentile are more probable than an inaccurate reflection of the true portion size.

If an in-person interview is used, PPC recommends a model of a 6-ounce portion of common cut of fish. If an Internet survey is used, photos of 6-ounce and 8-ounce portions on a standard dinner plate with a common table item for reference is recommended. And, if a phone interview is selected, describing a familiar object for the respondent to relate to is recommended if the respondent is unable to identify the weight they consumed.

Preparation Method

Considerable discussions occurred over how the food was prepared and what portions of the fish were consumed. IDEQ determined that the parts of fish were a lower priority and the questionnaire should only ask about how the fish was prepared.

CONCLUSION

The Boise State University Public Policy Center was tasked by the Idaho Department of Environmental Quality to develop a research methodology to estimate the consumption of fish and shellfish, both native to Idaho as well as non-native, for the purpose of establishing water quality criteria for the state. Throughout the development of this method, the PPC has consulted with experts at IDEQ, the EPA, IDFG, the NCI, and a number of private research firms. We have also responded to the suggestions of Idaho's stakeholders, and have worked with Idaho's tribal authorities in the attempt to produce a survey that will be consistent with their efforts.

Throughout, PPC staff have been mindful of the difficulties in establishing confidence intervals to be worked on to estimate the amounts of fish and shellfish eaten by high consumers, have addressed the problems that can arise as a result of recall bias and seasonality, accounted for the effects of infrequent consumers falsely recorded as never consumers, and responded to the concerns shared by all surveys in capturing minority or difficult to reach populations. PPC is proposing a survey targeting all adult Idahoans, and a nearly identical survey targeting all licensed adult anglers in the state. Each survey is suggested to be conducted on three occasions to address seasonality. Or, in the alternative, IDEQ may want to consider creating twelve panels and run one panel over each month with a recall the following month. We recommend a mailing to identify those willing to participate in this survey, which can be conducted both by telephone as well as over the Internet. It is recognized that with moving from households to individuals this recommendation may be problematic for cell phone only individuals. Consideration should still be given to paneling the sample between Internet and telephone.

Given that there is no previous fish consumption survey in Idaho, this will be the first attempt to identify high consumers in Idaho, and precise determination of the sample size required is impossible. However, PPC recommends that in order to satisfy the analytical demands of the NCI method of estimation of food frequency consumption, IDEQ be prepared to sample as many as 7,000 respondents. PPC is recommending these surveys assess both 24-hour and 7-day recall, as the necessary number of cases required by the NCI method to determine within-person consumption variance will be reached more quickly with a 7-day recall.

There has been considerable discussion during the process regarding using 7-day recall data. There is no disagreement on whether or not the model will run with 7-day recall as opposed to 24-hour recall. The issue remains whether the reliability of a 7day recall is comparable to a 24-hour recall. To date there does not appear to be any analysis that compares the reliability of 7-day or 24-hour recall. This question will not be answered until a study is conducted that collects both data sets and is able to compare the two results. This contribution to the knowledge base will be helpful to other states contemplating similar studies. More importantly, IDEQ is proceeding to collect data for what is being termed the NCI method. If successful they will make a significant contribution to the overall understanding of episodic consumption. However, because they are forging new territory it is prudent that IDEQ have a second best alternative plan in place. Collecting both 24 hour and 7-day data will increase the probability that they will have a data set of two periods' recall that can be used. This has the probability of providing better understanding of Idahoan FCR over using a traditional food frequency survey.

Once conducted, the research methodology and questionnaire as proposed will offer a quality data set that can be subjected to a wide range of statistical analyses, including the NCI method. The PPC suggests that this approach will produce data that will enable IDEQ to determine the fish and seafood consumption rates of the Idaho population with sufficient precision to enable defensible water quality criteria.

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GLOSSARY

There are a number of technical terms with definitions that are more precise than used in everyday conversations. The following annotated glossary contains terms have been used in the presentations and discussions before the negotiated rule-making committee meetings.

Between-person variance is a term that describes the difference in the variation in the amount of fish between two respondents over two 24-hour recall surveys.

Bimodal distribution is a continuous distribution with two distinct modes or peaks.

BRFSS, Behavioral Risk Factor Surveillance System, is a CDC program which conducts an annual behavioral risk assessment survey nationwide. The CDC allows states to add in a number of their own questions. Idaho put in FFQ questions on the 2007 and 2012 surveys for Idaho residents.

CDC, Centers for Disease Control and Prevention

Central limit theorem also referred to the central tendency theorem postulates that with sufficiently large number of iterates of independent random variables with a well-defined mean and variance will tend towards a normal distribution. This is the foundation of statistics and the null hypothesis (as defined by the study objectives) has repeatedly been disproved making this assumption a theorem.

Common core questions are the same or similar questions used in different survey populations. As long as the samples are random, if the same questions are asked, the data can be compared across survey instruments.

Confidence interval is an interval estimate of a population parameter used to indicate the reliability of an estimate. CI gives an estimate of getting the same answer with repeated surveys.

Confidence level is also known as confidence coefficient and is defined as the proportion of CIs that contain the true values.

Ex ante refers to decisions made before the survey.

Post hoc refers to decisions made after the survey.

FCR, fish consumption rate is defined as grams per day consumption of fish.

FFQ is a food frequency survey that models how often respondents consume a food item.

Histogram is a graphical depiction of the distribution of data.

Household is defined as people who are currently living at the targeted address.

IDEQ, Idaho Department of Environmental Quality

IDFG, Idaho Department of Fish and Game

Incidental catch refers to a part of a catch or harvest that was not originally targeted but was caught and retained.

Ever fish consumer is defined as an individual who consumes fish. This definition is not limited by a specific time frame

Idaho Fish License holder is an individual who is over 18 years old and has either a current license or a license within the last 12 months. For calendar year 2012, the target population is estimated at 449,963.

Log normal distribution using a logarithmic transformation of a single tailed distribution to a normal distribution. The transformation is necessary to utilize the central limit theorem.

Mean is another term for average. An arithmetic mean is $X = x_1 + x_2 + \dots + x_n / n$.

Median is the value where 50% of the population is less than the value and 50% of the population is greater than the value.

Mixed survey method is a mixed method using the same survey instrument (questionnaire) and collecting responses by different methods, such as in-person interviews and telephone.

Minority population in Idaho is small. With approximately 83 percent of Idahoans reporting themselves as white and 10 percent reporting themselves as Hispanic, this leaves all other ethnicities and nationalities to 2 percent of Idaho population. The very small percent of population will be represented in the random sample. It will not be possible to statistically determine their unique consumption patterns.

Mode is the most common value in a group of values.

NCI, National Cancer Institute

NCI method is a statistical approach pioneered by the NCI that uses the assumption that the within person variance does not vary across consumption frequency distribution to create the food frequency distribution based on two 24-hour recall surveys.

Never fish consumer is a true non-fish eater.

Non-game fish is any fish not specifically referred to in Idaho Fish and Game rules and regulations as a game fish.

Normal distribution is a symmetrical bell-shaped curve where the mean, median and mode are equal to each other.

Often defined as $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

Operational definition is also known as a functional definition. This is a definition that is used to define a variable term or object.

Probability density distribution describes the probability that a random variable will fall within a particular area of the distribution as defined by the integral.

Probability distribution assigns a probability to each measurable outcome of a random experiment.

Percentile is a cumulative measurement where the 90 percentile is where 9 in 10 people are at or below the defined point on the horizontal scale. We often say the 90th percentile when we mean 1-90th percentile. Or the 1 in 10 person that is to the right of the point on the horizontal scale.

Poacher is defined as an individual who violates do does not follow the rules presented in the 2013-2015 IDF&G Fishing Season and Rules booklet.

Random variable is also known as a stochastic variable that does not have a single value but subject to chance where it can take on a value with an associated probability.

Recall bias occurs when a respondent provides a response that is shaped by an external factor not asked by the question. An example would be where a respondent wants to give the "right answer" to the interviewer and overstates the frequency that they consume fish.

Respondent is defined as an adult associated with the mail or telephone number.

Robust assumption is an assumption that can be relaxed and the conclusions from the model are not overly impacted.

Sample design or sampling design specifies each possible sample and its probability of being drawn.

Sample frame is a subpopulation that has every characteristic the survey instrument is measuring. In this study, the sample frames are total population and angler population and their consumption of fish.

Sampling frames are the lists of members of a target population from which samples are drawn. Ideally, the sampling frame will include every member of the target population. IF&G will provide a list of licensed anglers for that survey, and the implementing agency will have access to and recommendations regarding the sampling frame for the general survey.

Sample Panel is a sample population that will be contacted more than once and asked a set of same questions.

Sample population is a subset of the target population randomly selected to represent the target population. For calendar year 2012, the target population is estimated at 1,596,000.

Sample survey methods are techniques for drawing inferences about a population based on measurements of a sample of that population. Data can be collected by mail, telephone, in person, by using an internet interface, or some combination of these.

SES, social economic status

Simple random sampling is where each element in the frame has an equal probability of selection.

Single tailed distribution is a skewed distribution that can be defined as having a right tail or left tail. A right tail skew is where the median is to the left of the mean or the mean > median. The distribution curve will look like it has a long tail tapering off to the right on the horizontal scale.

Skewed distribution is a non-symmetrical bell-shaped curve where the mean and median are not equal.

Stratified sampling organizes the random sample into separate strata to minimize within strata variability and maximize variability between strata. Sometimes researchers stratify after the survey is delivered.

Survey method is the technique for reaching the sample population, telephone, in-person, etc.

Survey instruments are techniques for drawing inferences about a population based on measurements of a sample of that population. Data can be collected by mail, telephone, in person, by using an internet interface, or some combination of these.

Systematic sampling starts with a random sample then selects on some regular intervals. In essence, this is probability sampling.

Target population is population that the researcher is interested in modeling.

TMT, Telephone Mail Telephone survey method

TMI, Telephone Mail Internet survey method

24-hour recall method is a survey method that uses a short recall period for respondents to access their memory. Usually, the researcher wants two 24-hour recall surveys to develop the within-person variability.

USEPA, United States Environmental Protection Agency

Within-person variance is a term describing the variation in the amount of fish consumed by the same person over two 24-hour recall survey.

APPENDIX A – FCR Articles

Citations for Washington FCR surveys

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Further Discussion of Tooze Article

It is the assumption that one is able to separate out the error and covariates of the within-person variance to be able to determine the between-person variation. Tooze suggests that the error tends to skew upward which will upward bias your means for the between person variance. This does not invalidate the NCI the authors are pointing out an issue to be aware of. Page 1575, *Journal of the AMERICAN DIETETIC ASSOCIATION* October 2006 Volume 106 Number 10,1” Unlike most nutrients, which are consumed daily, estimating usual intake of episodically consumed foods presents unique challenges for statistical modeling.” “These challenges are: (a) accounting for days without consumption of a particular food or food group; (b) allowing for consumption-day amount data that are generally positively skewed and have extreme values in the upper tail of the intake distribution; (c) distinguishing within-person variability, which consists of day-to-day variation in intake and random reporting errors, from between-person variation; (d) allowing for the correlation between the probability of consuming a food and the consumption-day amount; and (e) relating covariate information (e.g., sex, age, race, ethnicity, or education level) to usual intake (1).”

And, page 1578 Journal of the AMERICAN DIETETIC ASSOCIATION October 2006 Volume 106 Number 10 "Two or more 24-hour recalls on a number of individuals with reports of the food of interest are required to distinguish between- and within-person variation. The model is specified on the transformed scale where the person-specific effect and within-person random variability are normally distributed."

Citations for 7-Day Recall

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APPENDIX B – QUESTIONNAIRE

Preface (not part of the Questionnaire)

Reason for a Fish Consumption Survey: To respond to EPA's May 2012 disapproval of Idaho's 2005 update of its human health criteria based in part on a fish consumption rate of 17.5 g/day. EPA said it could not conclude it was protective of all who consume fish from Idaho waters.

Thus, DEQ needs to know how often Idahoans eat fish (or shellfish), how much they eat, where they get this fish (or shellfish) – is it from Idaho waters or elsewhere, and if from Idaho waters are the fish resident or migratory. This information will be used as one of several factors that go into calculation of revised criteria to protect human health and regulate discharge to toxic pollutants to Idaho waters.

Objective: Develop a distribution, with confidence bands, of the long-term average rate of consumption of fish and shell fish (expressed as a daily average rate) for two target populations:

- 1) All adult Idaho residents
- 2) Adult resident anglers

How: Questionnaire will be executed as a blended telephone/Internet survey, with a mailed invitation to participate. The mailed invitation will include visual aids of species and portion size for those selected to participate by phone. The same visual aids will be available online for those selected to participate via Internet.

Fish Coding Table

Coding Table for Fish and Shellfish		
Code	Idaho Fish	Commercially Marketed Fish/Fish Products
A	All trout (rainbow, cutthroat, lake, brown, brook) and landlocked salmon (kokanee and Coho)	Trout (hatchery or pen raised)
B	Ocean-going Chinook (spring, summer, fall), steelhead, Coho	King, Chinook, steelhead, Coho
C	Crayfish	Crayfish, crab (Dungeness, Snow, King, etc.), lobster, shrimp
D	Whitefish, arctic grayling, and cisco	Smelt, Tilapia, Sole/Flounder, Mackerel, Herring, Anchovies
E	Bluegill, crappie, pumpkinseed, warmouth, perch, walleye, Muskie, pike, large and smallmouth bass	Bottom fish - cod, snapper, rockfish, bass, perch, walleye
F	Catfish, bullhead	Catfish
G	Nongame fish (carp, sucker, northern pike minnow, shiners, chisel mouth)	Nongame fish (carp, sucker, northern pike minnow, shiners, eel, chisel mouth, shiners, etc.)
H	Unknown	Unknown
I	All roe (eggs)	All roe (eggs, caviar)
J		Shark, swordfish, tuna, halibut, sturgeon
K	Freshwater mussels, clams	Mussels, clams (littleneck, soft shell, butter, cockles), snails
L		Oysters, geoduck, scallops, abalone
M		Octopus, squid, calamari
N		Sea urchin, sea cucumber, etc.

SURVEY INSTRUMENT FOR IDEQ DRAFT 11/24/2013

Survey Coding Sheet for Idaho FCS Interviewers code -----				Participant ID:		
Participant Phone #:				Participant Name (First only):		
Attempt #	Date	Time of Day	Complete	No Answer	Refused/Do Not Call	Other
1		<input type="checkbox"/> AM <input type="checkbox"/> PM				
2		<input type="checkbox"/> AM <input type="checkbox"/> PM				
3		<input type="checkbox"/> AM <input type="checkbox"/> PM				
4		<input type="checkbox"/> AM <input type="checkbox"/> PM				
1A.	Hello, I am calling from [implementation agency], on behalf of the State of Idaho. We are trying to get a sense of how much fish and seafood Idahoans eat and would like your help with a brief survey. Is this <i>[name of participant]</i> ?				Yes Go to Intro	No Go to 1B
1B.	Is <i>[name of participant]</i> available?				Yes Wait for participant, go to Intro.	No go to 1C
1C.	Is there a better time or number to reach <i>[name of participant]</i> ? Thank you for your time. We will contact <i>[name of participant]</i> at <i>[time]</i> at <i>[number]</i> .				Time:	Number:
Intro	For most people, this will take only a few minutes, but if you eat fish or seafood and especially if you eat fish from Idaho waters, it may take up to fifteen minutes. All information gathered in the survey will remain strictly confidential. [If asked: The purpose of this research is to assess the types and quantities of fish and seafood consumed by Idahoans in order to better understand how to protect your health, establish water quality standards and to protect fish habitat.] We would like to include your opinion if now is a good time?				Yes, go to 2A	No go to 1C
	INTERVIEWER SUMMARY NOTES				FIRST SURVEY <input type="checkbox"/> Y <input type="checkbox"/> N	
					SECOND SURVEY <input type="checkbox"/> Y <input type="checkbox"/> N	
					THIRD SURVEY <input type="checkbox"/> Y <input type="checkbox"/> N	
					FOURTH SURVEY <input type="checkbox"/> Y <input type="checkbox"/> N	

2A.	Are you 18 years of age or over?	Yes, continue to 2B		If No, Request an adult in household (begin new survey form)			
2B.	Are you male or female?	Male	Female	If necessary for gender quota, ask for another adult from household. Begin new survey form.			
3A.	Have you eaten fish or seafood in the last year?	Yes, go to 4A	No, go to 3B.	Don't Recall, go to 3B.	Call Terminated		
3B.	<p>IF NO OR DON'T RECALL, THEN PROMPT: When asked about fish or seafood, sometimes people will overlook about things like pizza with anchovies, bagels and lox, tuna or other fish sandwiches (including fast food), fish and chips, clam chowder, tuna or other seafood casseroles, sardines, pickled herring, smoked fish, seafood salad, and the like.</p>			Yes	No		
Pizza with anchovies							
Bagels and lox							
Tuna sandwich							
Fish and chips							
Clam chowder							
Fast food fish sandwich							
Paella or other seafood casserole							
Seafood salad							
Pickled herring							
Smoked fish							
Other							
If none of above, go to question 12.							
4A.	How often would you say on average you eat fish or seafood including shellfish? You may provide your answer in number of times per week, month or year.						
		Times a week:			Move next	No recall, move next	
		Times a month:			Move next	No recall, move next	
		Times a year:			Go to 4C	No recall, move next	
4B.	If you don't know what is your best estimate?				Go to 4C		
4C.	What do you estimate is the average size of the portion of fish you eat?		Portion Estimate	#	Go to next section		
<input type="checkbox"/>		Card Deck					
<input type="checkbox"/>		Checkbook					
<input type="checkbox"/>		Smartphone					
<input type="checkbox"/>		Pieces					
<input type="checkbox"/>		Ounces					
<input type="checkbox"/>		Cups					
<input type="checkbox"/>		Cans					
		oz./can					

24 HOUR RECALL

This part of the survey deals with any fish, shellfish or seafood that you may have eaten at any time yesterday.

5.	Thinking about yesterday, did you eat fish, shellfish or seafood? Please remember to think about breakfast, snacks, lunch or dinner, including at restaurants or social gatherings.	Yes, go to 6A.	No, go to 8A
6A.	Yesterday, did you eat fish or seafood at more than one meal or snack?	Yes, go to 6B.	No, go to 7
6B.	How many meals or snacks with fish or seafood did you eat?	NUMBER OF MEALS OR SNACKS	

This next series of questions will help us identify information about the type, quantity and frequency of your most recent fish consumption. Please consider the first (or next) meal or snack where you consumed fish yesterday.

7A.	What type of fish or seafood did you consume?	Refer to Species Coding table to fill in participant's responses.
7B.	Thinking about this same meal, where did the fish or seafood come from?	Prompt participant with list in table
7C.	Thinking about this same meal, what was the portion size that you consumed?	Prompt participant with list in table
7D.	Thinking about this same meal, what parts of the fish did you consume?	Prompt participant with list in table
7E.	This is the last question about that meal, can you tell me how was the fish prepared?	If participant ate fish at more than one meal or snack, repeat questions 7A through 7E until all meals or snack where fish were consumed are identified.

Meal/ Snack	Type of Fish	Source of Fish	Portion Size		Parts Eaten	Cooking Method	
1.		<input type="checkbox"/> Market <input type="checkbox"/> Restaurant <input type="checkbox"/> Sport-Caught <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside Idaho <input type="checkbox"/> Gift	<input type="checkbox"/>	Portion Estimate	#	<input type="checkbox"/> Flesh <input type="checkbox"/> Skin <input type="checkbox"/> Guts <input type="checkbox"/> Whole	<input type="checkbox"/> Fried <input type="checkbox"/> Baked <input type="checkbox"/> Broiled/Grilled <input type="checkbox"/> Poached <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw <input type="checkbox"/> Dried, smoked, salted <input type="checkbox"/> Canned/pickled <input type="checkbox"/> Stew or soup
			<input type="checkbox"/>	Card Deck			
			<input type="checkbox"/>	Checkbook			
			<input type="checkbox"/>	Smartphone			
			<input type="checkbox"/>	Pieces			
			<input type="checkbox"/>	Ounces			
			<input type="checkbox"/>	Cups			
			<input type="checkbox"/>	Cans			
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7 DAY RECALL

The next part of this survey will collect data about any fish, shellfish or seafood that you may have eaten in the last 7 days excluding yesterday.

8.	Excluding yesterday, have you eaten fish or seafood in the last 7 days? Please remember to think about breakfast, snacks, lunch or dinner, including at restaurants or social gatherings.	Yes, go to 9A	No, go to 11
9A.	Excluding yesterday in the last 7 days, did you eat fish or seafood at more than one meal or snack?	Yes, go to 9B.	No, go to 11
9B.	How many meals or snacks with fish or seafood did you eat?	NUMBER OF MEALS OR SNACKS	

This next series of questions will help us identify information about the type, quantity and frequency of your most recent fish consumption. Please consider the first (or next) meal or snack in the last 7 days, excluding yesterday, where you consumed fish.

10A.	What type of fish or seafood did you consume?	Refer to Species Coding table to fill in participant's responses.
10B.	Thinking about this same meal, where did the fish or seafood come from?	Prompt participant with list in table
10C.	Thinking about this same meal, what was the portion size that you consumed?	Prompt participant with list in table
10D.	Thinking about this same meal, what parts of the fish you consumed?	Prompt participant with list in table
10E.	This is the last question about that meal, can you tell me how was the fish prepared?	If participant ate fish at more than one meal or snack, repeat questions 10A through 10E until all meals or snack where fish were consumed are identified.

Meal/ Snack	Type of Fish	Source of Fish	Portion Size		Parts Eaten	Cooking Method	
1.		<input type="checkbox"/> Market <input type="checkbox"/> Restaurant <input type="checkbox"/> Sport-Caught <input type="checkbox"/> In Idaho <input type="checkbox"/> Outside Idaho <input type="checkbox"/> Gift	<input type="checkbox"/>	Portion Estimate	#	<input type="checkbox"/> Flesh	<input type="checkbox"/> Fried <input type="checkbox"/> Baked <input type="checkbox"/> Broiled/Grilled <input type="checkbox"/> Poached <input type="checkbox"/> Microwaved <input type="checkbox"/> Raw <input type="checkbox"/> Dried, smoked, salted <input type="checkbox"/> Canned/pickled <input type="checkbox"/> Stew or soup
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			<input type="checkbox"/>	Smartphone		<input type="checkbox"/> Whole	
			<input type="checkbox"/>	Pieces			
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The next three questions are about your reasons for eating or not eating fish or shellfish

11.	There are many reasons that people eat fish. I'm going to read a list of reasons for eating fish, please indicate by yes or no if it is a reason for you to consume fish.	Yes	No
	a. Health benefits		
	b. It is readily available.		
	c. I enjoy cooking with fish and shellfish.		
	d. I like to eat it/enjoy the taste.		
	e. I'm an angler.		
	f. I'm a vegetarian, except I do eat fish or shellfish.		
	g. Fish or seafood is important to me culturally.		
	h. Other		
	i. None of these apply to me; I neither favor nor disfavor fish or seafood over other food choices.		
12.	There are many reasons that people may choose to not eat fish. I'm going to read a list of reasons for not eating fish, please indicate by yes or no if it is a reason for you to not consume fish.	Yes	No
	a. It's not easily available where I live.		
	b. It's hard to find fresh fish and seafood.		
	c. I don't know how to prepare it.		
	d. I don't like it/care for the taste		
	e. I can't afford it.		
	f. I have allergies or other health concerns.		
	g. I have environmental concerns, including pollution or about species sustainability of fish resources.		
	h. I have concerns about contamination of fish with things harmful to my health		
	h. I observe religious prohibitions		
i. I am a vegan or vegetarian			

	j. Other		
To conclude this survey we'd like to ask a few questions about you.			
13.	What is your age?		
14.	Of which ethnic group or groups are you a member?	Check the appropriate field	
	a. White [SKIP to #16]		
	b. Hispanic [SKIP to #16]		
	c. African-American [SKIP to #16]		
	d. Asian American or Pacific Islander [SKIP to #16]		
	e. Native American or Alaska Native		
	f. Other [SKIP to #16]		
	g. Refused		
15.	Are you a member of an Idaho tribe? If so, which one(s)?	Check the appropriate field	
	a. None		
	b. Coeur d'Alene		
	c. Kootenai		
	d. Nez Perce		
	e. Shoshone-Bannock		
	f. Shoshone-Paiute		
16.	What is your approximate household income? [Purpose: To determine if there are differences in fish and seafood consumption for people with higher or lower incomes]. Ask for individual income first then household if participant indicates there are other earners in the household.	Individual	Household
	a. \$15,000 or less		
	b. \$15,001 to \$25,000		
	c. \$25,001 to \$35,000		
	d. \$35,001 to \$45,000		
	e. \$45,001 to \$65,000		
	f. \$65,001 to \$100,000		
	g. over \$100,000		
	h. Don't know or refused		
17.	What is the highest level of education you've completed? [Purpose:].		
	a. Some high school, but did not finish		
	b. High school		
	c. Some college but did not finish		
	d. Two-year college degree		
	e. Four-year college degree		
	f. Some graduate work		

	g. Master or professional degree		
	h. Advanced graduate work or Ph. D.		
18.	What is your current weight? [Purpose: To determine if there are differences in fish and seafood consumption according to body weight.]		
19.	We'd also like to find out if there is variation in fish and seafood consumption around the state. May we have your zip code?		
20.	Finally, have you or any member of your household held an Idaho fishing license in the last 12 months (or a combined hunting/fishing license).	Yes	No
21.	We will be calling some of our participants again with follow up questions. With your approval we would like to call you again and ask these questions a second time. This helps us better understand the variation that may occur in fish consumption over time.	Yes	No
This concludes the survey. Thank you very much for your participation.			

APPENDIX C – IDHW BRFFS DATA

Percent of Idaho Adults Who Ate Fish* In the Last Year, 2012 BRFFS				
	%	Lower CI	Upper CI	n
Statewide	90.6	89.1	92.0	5410
Sex				
Males	92.0	89.6	94.0	2131
Females	89.3	87.3	91.1	3279
Age				
18-24	86.5	79.6	91.3	192
25-34	89.1	84.3	92.6	390
35-44	90.9	86.1	94.1	615
45-54	93.3	90.0	95.6	907
55-64	91.7	88.1	94.3	1257
65+	90.9	88.6	92.8	2006
18-34	87.9	84.0	91.0	582
35-64	92.0	89.9	93.7	2779
65+	90.9	88.6	92.8	2006
Income				
Less than \$15,000	87.1	80.9	91.5	589
\$15,000-\$24,999	83.8	78.4	88.1	907
\$25,000-\$34,999	91.9	86.8	95.2	658
\$35,000-\$49,999	92.1	88.0	94.9	809
\$50,000-\$74,999	93.6	90.0	95.9	797
\$75,000+	94.7	92.1	96.5	980
Education				
K-11th Grade	83.4	76.3	88.7	383
12th Grade or GED	90.0	86.9	92.5	1581
Some College	90.9	88.2	92.9	1737
College Graduate+	94.9	92.8	96.4	1696
Health District				
HD1	93.3	89.0	95.9	759
HD2	91.3	85.5	94.9	740
HD3	88.5	83.7	92.0	765
HD4	92.0	89.0	94.3	860
HD5	91.4	86.6	94.6	734
HD6	87.9	81.9	92.1	732
HD7	89.0	84.2	92.5	757

County Designation				
Urban	90.5	88.5	92.2	3159
Rural	91.1	88.0	93.5	1445
Frontier	91.7	87.1	94.7	743
Race (non-Hispanic)				
White	91.2	89.6	92.5	4964
AI/AN	95.5	86.9	98.5	63
<p>*Fish includes any type of freshwater or saltwater fish (with fins) prepared in any style cooked or uncooked. It also includes canned tuna, canned salmon, imitation crab and fish eaten at restaurants. It does not include shellfish such as shrimp, oysters, clams or real crab.</p>				

Percent of Idaho Adults Who Ate Fish That Were Caught in Idaho Waters in the Last Year*, 2012 BRFSS				
	%	Lower CI	Upper CI	n
Statewide	56.9	54.4	59.4	4634
Sex				
Males	64.3	60.5	67.9	1885
Females	49.8	46.6	53.1	2749
Age				
18-24	65.4	55.8	73.9	161
25-34	57.9	49.7	65.7	315
35-44	55.5	49.3	61.6	546
45-54	59.7	54.4	64.9	801
55-64	55.7	51.1	60.2	1118
65+	50.9	47.3	54.5	1657
Income				
18-34	61.3	55.0	67.2	476
35-64	57.1	54.0	60.2	2465
65+	50.9	47.3	54.5	1657
Less than \$15,000	55.6	46.7	64.0	482
\$15,000-\$24,999	51.2	44.8	57.5	756
\$25,000-\$34,999	61.5	54.2	68.4	569
\$35,000-\$49,999	56.4	50.0	62.6	704
\$50,000-\$74,999	58.3	52.1	64.2	710
\$75,000+	62.0	56.9	66.8	874
Education				
K-11th Grade	44.8	35.6	54.3	297
12th Grade or GED	58.0	53.4	62.5	1354
Some College	59.6	55.4	63.6	1487
College Graduate+	57.4	53.1	61.5	1484
Health District				
HD1	51.6	45.0	58.2	663
HD2	66.1	58.4	73.1	644
HD3	54.2	47.9	60.5	641
HD4	51.9	46.7	57.1	729
HD5	66.9	60.3	72.9	632
HD6	64.9	57.7	71.5	627
HD7	57.2	50.3	63.8	650

County Designation				
Urban	52.7	49.5	56.0	2671
Rural	63.0	58.3	67.4	1256
Frontier	71.0	65.2	76.2	659
Race (non-Hispanic)				
White	57.0	54.4	59.6	4271
AI/AN	70.4	51.0	84.5	58

*Among Those Who Ate Fish in the Past Year

Low SES is defined as: less than high school education, or annual household income less than \$25,001, or Medicaid is health care coverage used for most medical care, or no health care coverage. Excluded from the low SES category are those with a household income greater than \$50,000 or those with a 4-year college education.

Data collected from The Behavioral Risk Factor Surveillance System (BRFSS) 2012. For more details on this project or any of the survey results, please contact the Bureau of Vital Records and Health Statistics at (208) 332-7326.

APPENDIX D – SEAFOOD IMAGES

The proposed survey method recommends a mail/telephone/Internet survey. The questionnaire asks the type of seafood the respondent consumed. IDEQ is interested in aggregating the information into categories. Because seafood is so varied in the size and shape of its flesh, PPC believes this will have a significant impact on the accuracy of an individual’s single daily fish consumption estimate. This is irrespective of the survey method including in person, mail or telephone. However, it is also possible that the error in estimation may be random and if this is so, the within person variance estimate will mitigate this accuracy error. A good way to determine the magnitude of this potential accuracy issue is a controlled test retest experiment of an individual’s ability to estimate seafood quantity. This type of experiment is beyond the scope of this study.

PPC procured and weighed a number of flesh samples from the different categories to evaluate the interviewer’s ability to solicit quantity estimates visually and verbally. The density of fish and shellfish were remarkably consistent. Unfortunately, many of the possible foods that may be available to Idahoans for consumption are not consistently available for retail purchase. It is possible that these normally unavailable items to Idahoans are made available when there are specials at restaurants, transported from the coast by residents, or seasonal purchases by retail outlets. Consequentially, a more restricted sample was used. Table 7A provides the universe of seafood categories and indicates which categories had a sample of flesh weighed.

7A What type of fish or seafood did you consume FLESH WITHOUT SKIN OR SHELL					
		WEIGHED	CARD	CUP	AVIALABLE IN CANS
A	Trout	X	4.0		
B	Salmon & Steelhead	X	4.0		X
C	Crawfish				
D	Pan Size Fish	X	4.0		X
E	Large Fillet	X	4.0		
F	Unknown				
G	All Roe				X
H	Steak or Fillet	X	3.5 - 4.0		X
I	Small Clams	X		4.0	X
J	Large Clams				X
K	Small Invertebrates	X		4.0	
L	Large Invertebrates				
M	Crab	X		4.0	X
N	Cephalopods	X		3.5 - 4.0	
O	Other Seafood				X

The flesh that were sampled were Rainbow Trout, Coho Salmon, Dover Sole, True Cod, Swordfish Escolar, Foolish Mussels, Little Neck Clams, Pacific Oysters, 16 to 20 Shrimp 26 -30 Shrimp, Bay Shrimp,

Scallops, and Dungeness Crab. All the seafood was weighted at the fishmongers to determine portions. The crustaceans were weighed in shell and flesh only. The finfish were weighed with skin if that was the standard offering. The only fish that did not have flesh attached was the True Cod and Dover Sole. There were no crawfish or husked lobster. Dungeness was not weighed in shell. The card weighing was done outside of the fishmongers using a standard deck of cards case measured 0.5 by 3.5 by 2.5 inches. The container was filled with the flesh and weighed on a digital scale.

The method of weighing included two measuring instruments - a pack of standard playing cards case, and a 1 cup container with lid. The flesh was sized to fit the container. Allowing for some inaccuracy in filling the container, the sides bowing or air space between the bivalve bodies, the weights of the samples typically varied plus or minus 1/10 of an ounce or 2.8 grams. The notable exceptions were large steak or fillet and cephalopods categories. Escolar in the large finfish category was a substantially lower density fish than the other samples. Also, the Cephalopod flesh was of lower weight but it had considerable more air in the container due to the flesh structure. PPC recommends that if the amount consumed can be compared to a deck of cards or cup container, that 4 ounces or 114 grams are used as the comparative standard unit. Unfortunately, for a fillet from a large finfish, a piece of piece of bread may be a much more appropriate analogy. The photos of the salmon portions illustrate this issue. It is recommended that the following conversion table be used for large finfish.

Large Finfish Conversion Table					
Caught - fillet or steak			Retail		Restaurant
Under 5 pounds	1 deck	4 ounce	Standard	6 ounce	Each fillet 6 ounce
	1.5 deck	6 ounce	Large	8 ounce	
	2 deck	8 ounce	Extra Large	12 ounce	
Over 5 pounds	3/4 slice	4 ounce			
	1 slice	6 ounce			
	1.5 slice	8 ounce			

Trout, like certain small flat or other small finfish, have a unique shape that does not lend itself to a deck of card analogy. A checkbook was proposed as an alternative analogy. When 6- and 8-ounce fillets were chosen, they were visually larger than the checkbook, and a piece of bread also did not represent their shape. The institutions serve 6-ounce portions or one and one-half deck of cards. The density of the flesh was similar to salmon and the range of fillets was from 4 to 8 ounces. An 8-ounce fillet exceeded the diameter of a standard 10.5 inch dinner plate. With head and tail, the fish exceeds 12 inches. A 10-inch fish, standard stocker size, yields a 4-ounce fillet. Recognizing the issues, the standard analogy should be a checkbook that can be verified by how much of the plate is covered. For the angler population, having them estimate the length of fish caught and estimating the fillet size would be a reasonable approach. PPC recommends the following conversion table for trout and other small finfish.

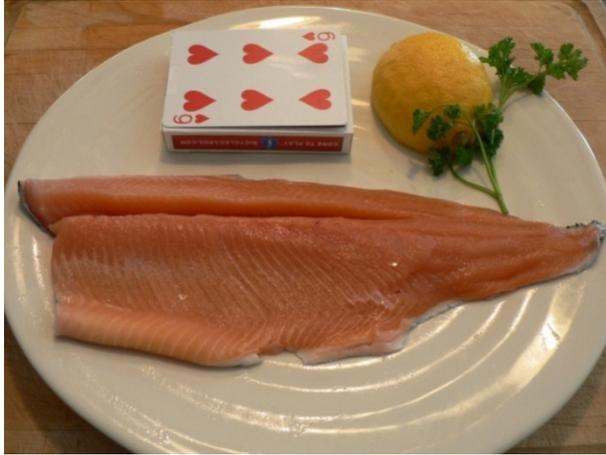
Trout and Small Finfish Conversion Table				
Caught		Retail		Restaurant
8 to 10 inch fish	4 ounce	Standard	4 ounce	Each fillet 4 ounce
10 to 12 inch fish	6 ounce	Large	6 ounce	
12 to 14 inch fish	8 ounce	Extra Large	8 ounce	
Over 14 inch fish	12 ounce			

Shellfish become more problematic as the bodies can vary within shell and the weight of the shell can vary. In speaking with the fish mongers, they recommend to their customers that one pound of clams or mussels is an appropriate amount that should yield approximately one cup of flesh. Mussels, little neck stone, and oyster flesh husked were available for weighing. The flesh was within the same variance as the fish at 4 ounces plus or minus 1/10 of an ounce. It is likely that if shellfish are purchased at a fishmongers that the 1-pound rule will prevail for the majority of bivalve consumers. PPC recommends that one cup at 4 ounces is the standard unit of measurement.

Crustaceans also fall into the 4-ounce portion standard if they are served in a restaurant or the portion size is adhered to in many recipe books. With the exception of crawfish, this classification of seafood must be purchased. If someone is husking their own crab or lobster, it will be almost impossible to determine the amount. A pound and a quarter lobster will yield over ½ pound of flesh with diligent picking if the lobster is ready to shed. This includes extracting the flesh from the legs, claws, tail and carcass. Often, lack of experience in husking results in a different portion size consumed. However, if it is what is termed a “shedder” the same size lobster in a tank may contain only ¼ a pound of flesh. Crabs have the same issue. Stores often have a set price for these food items making it difficult for the consumer to know the actual flesh amount they are purchasing. Shrimp do not have the same variance of flesh volume within their shell and will have a more consistent weight when purchased at the store. Recognizing the wide variance potential within the crustacean category, PPC recommends that a 1-cup standard be used unless respondent can recall ordering a “large” crustacean.

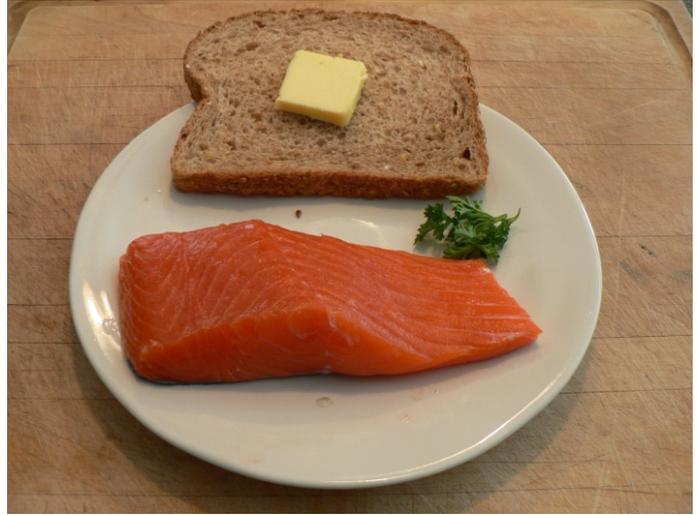
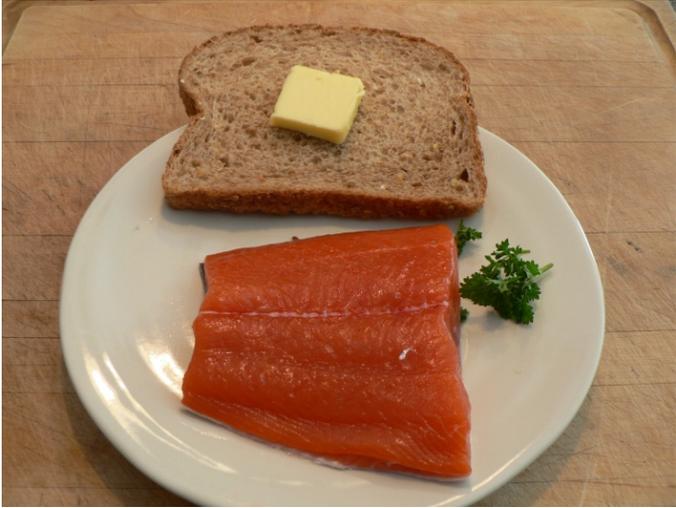
Canned seafood can range from 2 ounces for sardines and roe to 16 ounces for crustaceans and finfish. The most common finfish size is the 6 ounce tuna or salmon can. The more common cans of sardines and crustaceans are 4 ounces. PPC recommends that unless the respondent can recollect the can weight and believes it was a normal size can, then the interviewer should use 6 ounces for finish and 4 ounces for crustaceans and whole finfish as the unit of measure.

Most of the finfish consumed will be trout, salmon, steelhead and other large finfish. One can make the assumption that the typical portion served, whether steak or fillet, will be in the 6-ounce portion size. The variance may come with Idaho caught fish. Two tables have been provided to assist the interviewer in helping the respondent determine the weight of the portion consumed by either length of fish, weight of fish or analogy. Bivalves and crustaceans will be problematic if self caught or transported into the state to be consumed. If purchased at a retail outlet or restaurant, the portion size will be controlled and a reasonable assumption will be the 4 to 6 ounce portion size. There are several photos illustrative of the issues consumed. There is also a digital format of more photos that will be made available to IDEQ.

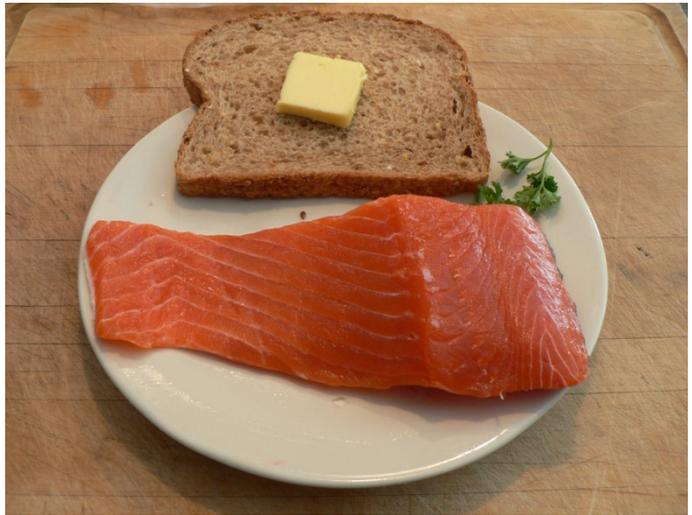
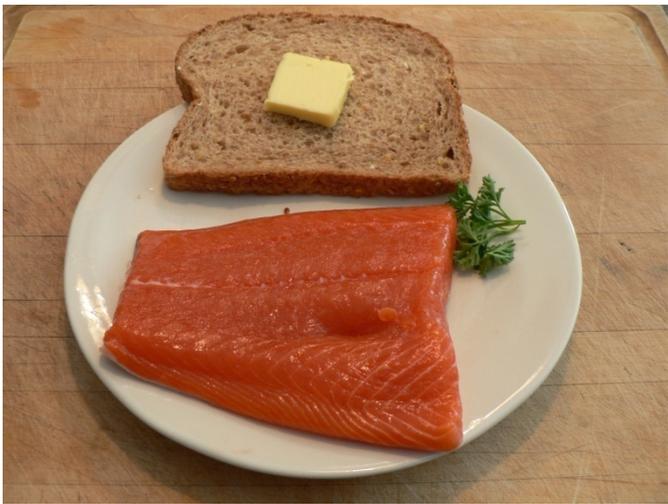


EXAMPLES OF SIX- AND EIGHT-OUNCE TROUT ON A 10.5 INCH PLATE



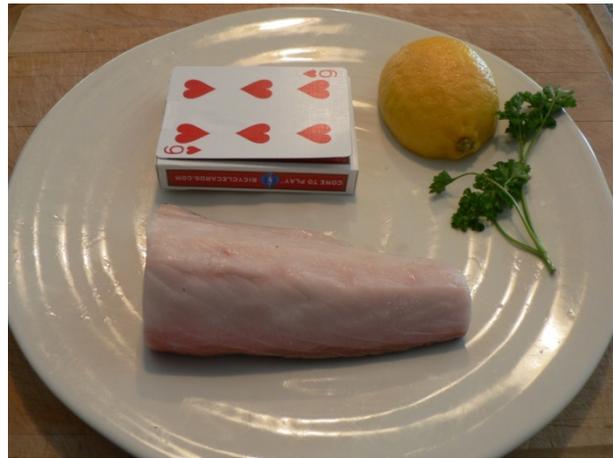
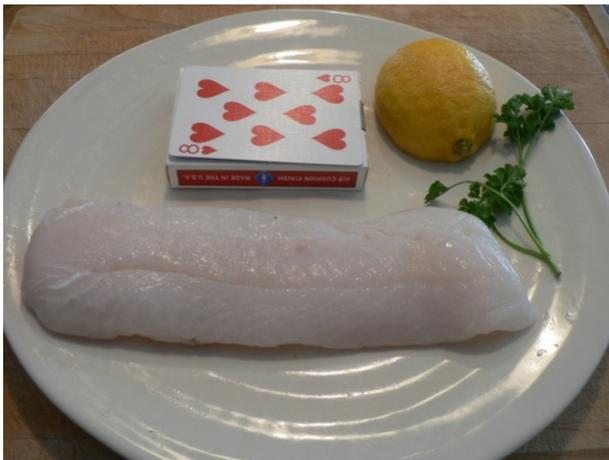


EXAMPLES OF SIX-OUNCE SALMON/STEELHEAD ON A 10.5-INCH PLATE



EXAMPLES OF EIGHT-OUNCE SALMON/STEELHEAD ON 10.5-INCH PLATE

AN EIGHT-OUNCE PORTION OF TRUE COD AND SIX-OUNCE PORTION OF ESCOLAR



EIGHT OUNCES OF SHRIMP [2 CUPS] AND ONE POUND OF LITTLE NECKS



APPENDIX E – NCI DISCUSSION NOTES

Use of the NCI Method in the Context of Fish Consumption Surveys

Wednesday May 22, 2013

Attendees: Lon Kissinger, Lisa Macchio, Jeff Bigler, Rose Galer (EPA), Amy Subar, Kevin Dodd (NIH), Eric Lindquist, David Eberle (Boise State University), Scott Fields (Coeur D'Alene), Kevin Greenleaf (Kootenai), Mike Lopez, Ken Clark (Nez Perce), Claudio Broncho (Shoshone-Bannock), Dianne Barton (CRITFC), Scott Hauser (USRT), Ken Merrell (Kalispel), Don Essig, Jeff From (IDEQ), Elizabeth McManus, Ken Ghalambor (Ross Strategic)

Drs. Amy Subar and Kevin Dodd from the National Institute of Health provided a review of the National Cancer Institute (NCI) method and how it can be used for fish consumption surveys for Idaho tribes and IDEQ. Background documents provided to the group that served as the basis for the discussion are available at:

http://riskfactor.cancer.gov/diet/usualintakes/usual_dietary_intakes_fact_sheet.pdf

<http://riskfactor.cancer.gov/diet/usualintakes/>

Overview

Dr. Dodd provided a brief overview and history of the NCI method. The method initially grew out of the need to understand long-term intake from multiple 24-hour recalls. The particular problem with 24-hour recalls was that instead of looking at a distribution of usual intake you get an additional component of variation because people do not eat the same thing every day; thus, it is hard to separate variation between daily and usual intake. A Food Frequency Questionnaire (FFQ) tries to directly query usual intake. The NCI method looked at a 24-hr recall versus FFQ and it turned out that 24-hr recalls tend to do a better job at single day intake, while a FFQ was better at longer-term intake. The NCI method combines these two approaches by developing a usual intake for episodically consumed foods.

Q & A

Q: What issues precluded use of the NCI method for the Colville Survey?

A: This largely grew out of nutrient intakes where there were multiple days of data. In order to separate the variability, you need to have a certain amount of people, but when dealing with episodic food intake estimating propensity is done with just a few people, yet you still have the problem of adjusting consumption day amounts. In the Colville survey, there were not enough people viewed to eat often enough, i.e., too few recalls and too small of a sample size. There were not enough opportunities to see someone consuming fish twice during the study period. This highlights the importance of working to make the survey design appropriate enough to use the NCI method.

Q: Mark Gauthier (UCUT): My understanding was the original goal in the Colville survey was four 24-hr recalls which was hard to achieve and cost prohibitive; the goal was then changed to two 24-hr recalls which was still costly and hard to achieve. Out of 1,100 people interviewed, only 120 reported consuming fish in that 24-hr recall, but with a FFQ you get 800 people that report eating fish.

A: The ability to incorporate FFQs into the NCI method has existed for awhile, but this raises an important point of dealing with fractions of consumers and never-consumers, i.e., some that eat fish all the time and some that never eat fish. At some point, if there is a substantial difference in probability to consume fish in the 24-hr recall and FFQ, we have to weigh the evidence to see which will be the reference instrument.

In regards to cost, past surveys have used interviewers which is very expensive. You could consider doing self-administered surveys that could be done online, which could save a lot of money. This would have to be piloted to ensure it works appropriately.

Q: Dianne Barton (CRITFC): Can you combine survey data collected online with data from personal interviews and still produce statistically verifiable results?

A: Yes, but with caution. When modes are different, they are never equivalent.

Q: Lon Kissinger (EPA): How will seasonal availability of fish be taken into account in conducting a survey? What about determining types of fish, e.g., total, locally harvested, anadromous? Are there concerns with dividing the data into finer categories?

A: The more episodic the consumption, the harder it is to do a standalone analysis, though we could come up with an approximation on best judgment. One way to work this out would be something along the lines of an overall look at frequency of fish consumption. You need a lot of data to make the dividing of data straight up, but you can make an approximation if you do not have that.

Q: Are there other approaches that might record dietary information as accurately as the NCI method, for example participant diaries?

A: Diaries can be quite biased. When people have to self-report, there tend to be issues where people want to appear as eating healthier or may decide to eat differently because they do not want to eat something they have to record. A 24-hr recall is considered independent of another recall, but a diary reports consecutive days so you cannot assume that is the case. Therefore, in terms of statistical power, you are better off with more independent info (24-hr recall) than correlated info (diaries).

Q: Marc Gauthier (UCUT): Wouldn't a diary for fish be less biased than a diary for your entire diet?

A: That could be the case. There are different levels of bias across all three methods (diary, FFQ, 24-hr recall). The bias on fish may be less than an entire diet.

Q: Ken Clark (Nez Perce): Does the NCI method take dietary choices into account, i.e., consumption suppression?

A: You are not likely to get that information from dietary intake data. The only way would be separate estimates for people perceived to have no barriers to availability, but that would still be a separate data set.

Q: Dianne Barton (CRITFC): Is this method less expensive because you can use a smaller sample size? I am concerned because the Colville survey could pay respondents to participate yet still missed the mark on the number of reporting days?

A: It is important to ensure the survey instrument is appropriate for the population. If the sample size is not large enough, you have to make assumptions to make up for the lack of data.

Q: Don Essig (IDEQ): If I understand correctly, there is a risk in the 24-hr recall approach of missing individuals that consume fish but do so infrequently; so you can compensate by doing a FFQ to estimate the chance you are missing those individuals. Have you been able to analyze what the affect is between surveys?

A: Not on a fish consumption survey, but there may be a data set available to answer those questions, e.g. the Tulalip survey used 24-hr recall and FFQ data.

Next Steps

Drs. Subar and Dodd expressed their willingness to work with PPC and IDEQ in the future and they plan to work in coordination with the survey design expert that will be hired to work with the Idaho tribes. 1) For the two 24-hour dietary recall surveys, include all respondents in the first 24-hr. survey, but then choose the highest fish consumers (from that survey) for inquiry in the second survey. Because of the positive correlation between frequency and amount per consuming episode, we will have a higher expected yield of second-day fish consumers by this sampling scheme than for an equivalent number of randomly chosen respondents. Brilliant! This is a nice shortcut toward getting the within-person variance. 2) The NCI method now includes the feature of estimating the percentage of true non-consumers in the population.

Sample email correspondence between DEQ, Boise State Univ. PPC, and Dr. Kevin Dodd (NCI):

Kevin, here are the questions.

- A) Related to #1--finding second-day consumers, does the SAS software available for download (and which implements the NCI method) include a provision for fewer than 100% of respondents having a second day 24-hr. report? When we previously ran the SAS software, we dropped those without a second day.
- B) Related to #2--non-consumers: Is that now incorporated in the SAS software, and does the output provide the estimated percent consumers and then the mean and percentiles (and standard errors) for consumers only? Are you using the Keogh-White methodology?
- C) Do you have tech reports or peer-reviewed articles or even just internal memos covering the assumptions and methods behind #1 and #2?
- D) Seasonal effect. This is not related to #1 or #2 above. We are likely to be interviewing during 9-12 months; each respondent would be providing their two 24-hour recalls within a few days span. Different individuals would be providing responses during different seasons. There will almost surely be a seasonal effect in consumption. If we do not do anything about that, then the seasonal effect will, presumably, be folded into the between-person variance. Thus, the distribution of "true" intake rates will be broadened and percentiles will be biased. Have you incorporated any kind of adjustment for this in the SAS software? If so, what is the methodology behind it? Alternatively, I suppose that we could put in season as a covariate (a categorical variable represented by dummy variables). That would generate one distribution per season, which we could then re-combine (hand-wavy here) with some weighting according to the duration of each season. This is beginning to sound like some add-on SAS or other programming to take account of seasons and end up with an appropriate mean, percentiles and SEs. What are your thoughts on this?

We would be very grateful for your thoughts on these issues. If you prefer a live call, we can do that.

Kevin's Response:

- A) The software available for download is only version 1 of the software. Version 2 will be posted soon, which has some enhancements. However, even the version 1 software can handle different people having different numbers of recalls. You could even have some people with 3, some with 2, and some with only 1.
- B) The never-consumers piece is handled best by yet a third version of the methodology, which uses Markov Chain Monte Carlo (MCMC) methods instead of likelihood methods to fit the models. The MCMC can model the probability of being a never consumer based on the FFQ, as was described to in the 2009 Kipnis et al. Biometrics paper. We tried modeling fish with never consumers in that paper as well, but the likelihood methods were unstable with only 2 recalls per person. Everything was fine with 4 recalls per person. The MCMC is more stable, and works fine with 2 recalls. This is not the Keogh and White methodology - their methodology has slightly stronger assumptions that they can get away with because they are using longer-term diaries. The MCMC (and the likelihood too) present distributions/SEs of the total population as well as the population excluding never consumers. The MCMC software is also coming soon (waiting on the user guide), but since we anticipate being an active participant in this project, we will make the software (and technical

expertise on its use) available to you ahead of the release to the general public.

- C) The 2009 Biometrics paper does talk about the assumptions behind the never-consumers model. However, after talking with some people here, I'd like to amend the suggestion that we only target self-reported high-consumers for the second recall. I think the statistics are only valid if we give everyone a chance to provide a second recall, but we can use sampling proportion to size (here size is the reported propensity to consume) to focus more heavily on high consumers. I think the survey sampling literature has tons of articles on this approach.
- D) The current software can automatically do exactly your hand-wavy approach for weekend vs. weekday effects. Minor modifications will allow a similar handling of season effects (put season as a covariate, estimate distributions of season-specific intake, then combine appropriately)

I'm pretty sure there will be some programming at our end to get a suite of programs in place that you can drop your data into and get the results out. We've done this in the past for several analyses, and it usually requires a little bit of talking about what exactly the needs are, followed by a moderate amount of coding and testing. The in-depth discussions of the stats involved probably can get folded into the discussion piece as we proceed with the project, and there may be some new wrinkles we iron out in this project that haven't been considered before.

APPENDIX F – IDAHO ANGLER TARGET POPULATION

The IDEQ FCS proposes to survey Idaho anglers. The questionnaire proposed for total Idaho population is proposed for resident angler population except for one question. It is unnecessary to ask if the respondent is an angler using the IDFG database, as the definition of an angler is that they hold valid license within the last 18 months. The advantage of using IDFG data set is that it removes the strata requirement of using the Idaho sample panel. Additionally, IDFG has experienced above 50 percent response rate with its fish take and economic surveys that should improve the completion rate for this target population.

Accessing the Data Set

IDFG is supportive of the IDEQ survey effort. To ensure that the proper privacy and security of data from unauthorized use, it may be necessary to have the Idaho Attorney General's office prepare the appropriate approvals between the two agencies to access the data.

Target Population

IDFG estimates that there are 425,000 anglers in Idaho. If one separates resident anglers, this number falls to 284,000. And, if youth licenses are excluded, it further reduces the target population potential to 262,000. Within this number is the potential for over reporting in that some residents may have two licenses and for under reporting as some residents may not purchase a fishing license every year.

Poaching

IDFG field officers spend approximately 50 percent of their time enforcing fish and game laws through routine patrols. They contact over 80,000 license holders or about 20 percent of the population. Of these contracts, the officers issue about 5,000 citations and warnings. This is just over 6 percent of the population contacted.

IDFG Customer License Detail

There are a number of fields in the data that can be used for identifying anglers. This will be necessary as an angler may have multiple licenses. Additionally, the data base has an issue date that will allow to identify current and recently expired license holders. Finally, IDFG does try to maintain a death list so that they are able to sweep license holders who have passed away to prevent asking for someone who is no longer living.

Tags Available with IFG Data Base
Sportsman ID
Name
Address
City
Zip Code
Phone Number
Gender
Height
Weight
DOB
Residency Date
County of Residence
Issue Date

License Options

IDFG has a variety of license options. This list excludes hunting only, non-resident, youth and steelhead/salmon tags. The first three exclusions have been discussed in the report. The steelhead/salmon tag must have a valid fishing license accompanying it. Should the other categories be included, IDFG can provide the appropriate codes.

Calendar Year 2012		
Resident Options for a Fishing License	Code	12 Month Sales
Adult Combination	101	88,058
Adult Fishing	103	118,967
Sportsman Package	104	19,044
Senior Combination	105	36,461
Adult Lifetime Combo	111	626
Adult Lifetime Fishing	113	69
Senior Fishing	118	1
Disabled Combo Class D	125	8,322
Disabled Fishing Class D	126	2,261
Disabled Combo Class V	129	2,830
Disabled Fishing Class V	130	130
Furlough Combo	131	369
Furlough Fishing	132	231
Daily Fishing License	135	7,054
Lifetime Certificates		
Adult Combination	AC	NA
Senior Fishing	SC	NA
Adult Fishing	AF	NA
Senior Fishing	SF	NA
Total Adult Fishing License		284,423
All Other Licenses		78,144
Total Licenses		362,567

Idaho Department of Fish and Game, January 1, 2013, "Comparison of Sales by Series" BA -69 Report for Month Ending December 2012.

IDFG SURVEY LETTER



IDAHO FISH & GAME
600 South Walnut
P.O. Box 25
Boise Idaho 83707-0025

Butch Otter / Governor
Cal Groen / Director

April 7, 2011

«First_Name» «Middle_Initial» «Last_Name»
«Address»
«City» «State» «Zipcode»

Dear fishing license holder:

The Idaho Department of Fish and Game is conducting an angler survey to estimate the current economic value of fishing in Idaho. Information gathered from this survey will help us to evaluate changes in fishing activity, angler preferences, and cost of a fishing trip in Idaho since our last survey eight years ago.

As a 2011 Idaho fishing license holder, you were selected to participate in this survey. Your response is important to help us estimate the fishing activity and current value of fishing in Idaho.

Please take a few minutes to answer the questions in the attached survey questionnaire. After completing the questionnaire, return it by mail in the prepaid envelope. **If you have not yet fished in Idaho in 2011, please complete the applicable questions and return the survey.** All your responses will remain strictly confidential and will only be used by the Idaho Department of Fish and Game for statistical purposes. By post-marking your response before May 15, 2011, your name will be entered into a drawing to receive one of five gift certificates worth \$100.00.

This survey will be repeated three more times during 2011; therefore, you may be surveyed more than once. Your participation in this survey will give us a better picture of people's fishing efforts during the early part of the year. Later surveys will help us complete the picture for the year. We hope you will participate again if asked. At the end of the survey, a grand prize drawing for a \$500 gift certificate will be held. Everyone who participated in the survey during the course of the year will be eligible for this drawing.

If any questions should arise regarding this survey, please contact Scott Grunder, State Fishery Manager at the above address or call 208-334-3791.

Sincerely,

Cal Groen
Director

This project is supported by
Sport Fish Restoration Act funds.

Enclosures:
Survey
Return envelope

Confirmation of Statement

David Eberle <weberle@boisestate.edu>

Fri, Dec 6, 2013 at 10:15 AM

To: David Parrish <david.parrish@idfg.idaho.gov>

Cc: Eric Lindquist <EricLindquist@boisestate.edu>

Hi David, I hope you are staying warm. Thank you for your comments. DEQ appreciates your recommendations on a revised fish table. It helped to move the discussion along.

There is one issue we do need your help on. I wrote this section on unlicensed anglers. I am getting push back to justify this statement. Since it came from our meeting last summer I am hoping that you can respond to this email in the affirmative so that I can attribute this statement to you. If you are uncomfortable please rework the language to give you comfort. Thank you for your time and I look forward to hearing from you, David

David Eberle

Unlicensed Anglers The group discussed how to treat unlicensed recreational anglers. Boise State University relayed their conversations with IDFG that all anglers (except for tribal members) need a license to fish legally in Idaho. And IDFG has found that few regular recreational fishers fail to obtain a license. IDFG simply does not consider this to be a substantive issue.

Parrish,David <david.parrish@idfg.idaho.gov>

Fri, Dec 6, 2013 at 5:18 PM

To: David Eberle <weberle@boisestate.edu>

Cc: Eric Lindquist <EricLindquist@boisestate.edu>

David,

Thanks for the note.

We all know there are unlicensed anglers who fish and harvest/consume fish from Idaho waters. It's our observation that these folks make-up an extremely small segment/percentage of the population compared to the number of people who are licensed. They would also be difficult to detect in the survey even if you took a subsample of all Idaho residents. In our estimation, it would be rare to find an unlicensed angler who consumed large amounts of fish from Idaho waters – simply because his chances of being caught without a license by an enforcement officer are very high.

For the sake of comparison, in 2012, we sold over 442,000 licenses that allowed people to fish in Idaho waters. Most of these licenses were purchased by Idaho residents. Statewide, we issued 138 warnings along with 100 citation to people who were fishing without a license. Most of the warnings were for not having a "license on person while fishing (they left their license at home, in the car, or just can't find it when they went fishing)." We have slightly less than 100 officers in the field. I don't know the exact

number of anglers they contacted in 2012, but if you look just at the ratio of officers to citations, you can see violation detection per number of anglers contacted is extremely low. I've worked checking anglers and doing creel surveys. It's not uncommon to check 200 people in a day. Risk of being caught fishing without a license versus cost/penalty is a large enough incentive for people to buy an inexpensive fishing license.

The cost of a fishing license is minor compared with potential (misdemeanor) fines and license revocation, not only in Idaho but 38 other states in the U.S.. Idaho is part of a "violators compact" that allows enforcement of fish and game rules across state boundaries. A daily fishing license costs \$12.75 and resident season license fishing is \$26.50. It cost seniors over 65 years of age and disabled people \$5 per year for a fishing license.

Avid, high consuming anglers have extensive amounts of gear, boats, pickups, campers, etc. Cost of a license is insignificant when you look at their other expenditures for a fishing trip. These people don't want to jeopardize their ability to fish/recreate over an item (fishing license) that costs so little. People who fish frequently and consume large amounts of fish know their odds of contact by an IDFG officer in a given year are very high.

I know this information is antidotal and probably won't convince people unfamiliar with the outdoors and fishing that this is a "non-issue."

Dave
David Parrish
Idaho Dept. of Fish and Game
Sport Fishing Program Coordinator