



IDAHO FISH CONSUMPTION RATE RECOMMENDED SAMPLE AND QUESTIONS

PREPARED FOR THE IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY



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INTRODUCTION

Project Overview:

The Idaho Department of Environmental Quality, IDEQ, tasked Boise State University to design a survey from which IDEQ will be able to determine the distribution of Idahoans' long-term rates of consuming fish and shellfish. This report provides recommendations for 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 that Idahoans consume finfish or shellfish.
 - a. Identify if fish were Idaho caught, market, or fish consumed in pre-prepared foods and restaurants.
2. Determining the mean quantity of fish consumed by consumption percentiles.
 - a. Identify the type of fish by fish groupings, the amount of fish consumed for the median Idahoan, 50th percentile, as well as for Idahoans who are high consumers, 95th percentile.
3. Determining the perception of whether fish consumption rates have been suppressed by external factors.
4. 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 US EPA and the 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, and
6. Internal validity and recommendations for external reliability

EXECUTIVE SUMMARY

The Idaho Department of Environmental Quality, IDEQ, contracted with Boise State University Public Policy Center to develop a fish consumption questionnaire and sample design. The IDEQ is responding to the USEPA'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 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) – is it from Idaho waters or elsewhere -- and if



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from Idaho waters are the fish resident or migratory. Boise State University participated in the negotiated rule making committee process, the tribal fish consumption rate technical group, and consultants as part of their recommendations. There are a number of unique attributes to surveying episodic events and individuals perceptions that have been incorporated into the recommendations.

Boise State University recommends a sample design that will require up to 7,000 surveys 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.

Boise State University developed a questionnaire for a blended telephone / Internet survey, with a mailed invitation to participate. The mailed invitation will include visual aids to 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. 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 to toxic pollutants to Idaho waters.

IDEQ is intrigued with the possibility of using a 24 hour recall method pioneered by the National Cancer Institute, NCI, for episodic food consumption. One of the greatest challenges of this project 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 imposed rigorous constraints on the sample design. This method, in contrast to other methods require that the researcher is able to identify a respondent who has consumed fish within the prior 24 hours and that this respondent is amenable to a call back in the future that happens to coincide with another episodic consumption within 24 hours of the second call. It is this method that is driving the sample size. There is great potential of improving estimates of episodic consumption of a population using this method. However, there are concerns over whether the software can be adapted from a nutritional dietary survey of multiple food stuffs to a single food stuff. As IDEQ is considering increasing the research design, Boise State University insured that the questionnaire and sample design may accommodate other statistical methods.

There is concern that seasonality may skew the results of Idahoans consumption of fish depending upon when the survey is conducted. IDFG has seasons for when fish can be taken from Idaho waters. The recall surveys will provide for the seasonality variance in respondents' consumption patterns. Boise State University recommends that IDEQ adopt three seasons to provide a time frame to test for the impact of seasonal consumption. It is beyond the scope of this report to recommend how to correct for seasonality; the statisticians have an arsenal of tools to remove this influence if surveys are conducted at least once during each of these three periods.



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There was considerable discussion about how to insure representation of hard to reach populations. These may include those with ethnic origins whose culture traditionally consumes fish. Also of interest are populations of sufficiently low income that subsistence fishing is a regular part of this population's normal diet. Boise State University 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. Boise State University does not recommend that IDEQ take extraordinary efforts to attempt to identify these groups beyond those captured in the sample frame. Once this study is complete the agency 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 Asian decent respondents.

There will be tradeoffs necessary between all the objectives outlined and the 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.

FCR SURVEYS AND ARTICLES

A number of studies and articles have been reviewed in the preparation of this report. The focus of this report is the development of recommendations for a sample design and questionnaire. These recommendations have been based 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.

National Health and Nutritional Examination Survey

The 2011 EPA national estimates for fish consumption are 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 estimated, it is more problematic to derive the quantity of fish consumed. This survey used a 24-hour recall probabilistic model developed by the National Cancer Institute, NCI¹.

¹ Janet A. Tooze, PhD, Mph; Douglas Midthune, Ms; Kevin W. Dodd, PhD; Laurence S. Freedman, PhD; Susan M. Krebs-Smith, PhD, Mph, Rd; Amy F. Subar, PhD, Mph, 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.



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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 more like coastal states.

COLUMBIA RIVER INTER TRIBAL FISH CONSUMPTION

The CRITFC report was found to be useful in what they identified as possible weaknesses in their report. The survey was conducted in November, a month of low fish consumption. The report conjectured that it 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 recommendations for Idaho include sampling several times within a year to capture any seasonality. Additionally, the study is valuable in that it is a good reminder that in-person surveys will have limitations. Conducting in-person surveys across a wide geographical area is expensive and difficult to administer without introducing systematic bias into the data.

Washington Department of Ecology Fish Consumption Rates

The State of Washington has conducted a number of FCR surveys on its population. These earlier studies provided a foundation for the current draft report. 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 recreational angler surveys that have produced a mean range of 6 g/day for fresh water fish to 214 g/day for the Suquamish Tribe. How subpopulations of Idahoan may impact the statewide FCR has been carefully considered.

1998 Fish Consumption Survey, Spokane River, Washington WDEQ

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 take rate. The response rate for this sample of people with fishing licenses was 31.35%.² "Of the respondents who completed the survey, 59.1% reported keeping fish for themselves."³

IDFG Annual Angler Survey The IDF&G angler surveys for 1994, 1999, and 2006 had a sample size range between 1,200 to 2,000 license holders. They received a response rates that ranged from 45 to 58 percent.⁴ The relatively high response rate may be due to the involved stakeholders with the health of

² WDEQ, 1998 , Fish Consumption Survey Spokane River, Washington, Spokane Regional Health District Assessment/Epidemiology Center

³ *ibid*, p2

⁴ See Willard IDFG, 2007



fish populations. Additionally, as with the Spokane River survey, both used mailers to introduce the sample population to the study. The other directly relevant information from the surveys is that Idahoans preferred and most often ate trout. This implies that when developing fish categories, that trout should have their own grouping.

Behavioral Risk Factor Surveillance System

The Center for Disease Control and Prevention conducts surveys in which they allow states to insert their own questions. Idaho Department of Health and Welfare inserted a food frequency question that included fish in the 2005 and the 2012 survey. The survey asked both the frequency of fish consumption as well as whether it was an Idaho caught fish. The survey interviewed respondents over a twelve 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 are used in determining the response rates for the 24-hour recall sample. Two additional observations are relevant from this data. The first is that socioeconomic 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.

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

The Tooze article makes the argument for the NCI method. To date this method was used for dietary nutritional intake. While there are similarities between the national nutritional dietary surveys, there are also differences that raise concern. The concern is that the NCI 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.⁵ 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 method that assumes the 24-hour recall is an unbiased estimator of the untransformed usual intake. This is a problem, as we know that fish intake is a heavily skewed distribution.⁶ These issues remain unresolved at this time.

⁵ Usual Dietary Intakes: Background, <http://riskfactor.cancer.gov/diet/usualintakes/> Last accessed 7/26/2013

⁶ Kevin W. Dodd, Phd; Patricia M. Guenther, Phd, Rd; Laurence S. Freedman, Phd; Amy F. Subar, Phd, Mph, Rd; Victor Kipnis, Phd; Douglas Midthune, Ms; Janet A. Tooze, Phd; Susan M. Krebs-



DEFINITIONS

Introduction

Operational definitions are the specific boundaries of the target population. Recordkeeping often does not align with the research question. It is at 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.

Target Populations

There are two target populations identified. The first is all Idaho adult residents. The second target population is Idaho adult residents who have held an Idaho resident license within the last 18 months. The second target population is more restrictive.

Survey Respondent

In developing the sample, one of the early decisions that must be made is the survey respondent. The researcher needs to consider how the respondent is to be reached, the geographical barriers and the ability to get respondents to participate. There is general agreement that using households as the survey unit has a number of advantages. It increases the opportunity that a respondent will be reached at home. However, further discussion about using households as a survey unit and trying to implement follow-up surveys to address within person variability has led Boise State University to recommend that the sample design target individuals as the survey unit.

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.

A 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

Smith, Phd, Mph, RdStatistical, "Methods for Estimating Usual Intake of Nutrients and Foods: A Review of the Theory" J Am Diet Assoc. 2006;106:1640-1650.



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reader aware of the possible bias, it is sufficient. Boise State University recommends that the questionnaire ask the household unit 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 a household responds negatively to the last 12-month consumption question, the interviewer is recommended to prompt with a series of additional questions to insure 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 to the rule-making committee a graphical depiction of over-reporting never fish consumers. The impact 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 significantly 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? Boise State University recommends that if the resident has had a fishing license within the last 18 months they be considered an Idaho angler.

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. Boise State University 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. Boise State University 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.



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Youth anglers are allowed to fish without a license if accompanied by an adult. There are ethical issues that restrict interviewing youths. Boise State University 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 IDFG⁷ they have a high degree of confidence that individuals who regularly fish will have a license. The compliance officers are regularly on the waters and 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 fish. 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.

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. Also 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. Boise State University 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 this subpopulation is a high fish consumer.

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.

⁷ Personal communication with Mr. David Parrish with IDFG



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 Wabanaki⁸ Tribe FCS dietary survey used this approach. This provides a rich descriptive analysis of consumption patterns; 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 fish consumption
- Climate change
- Internationalization of air quality

Boise State University 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 Boise State University does not recommend they be included as a factor in evaluating “true” fish consumption rates.

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. Boise State University recommends that the interviewer is explicit that the purpose of the survey is to measure Idahoans fish consumption. This will allow the interviewer to quickly identify non-fish consumers and move to the next sample.

⁸ 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



FISH CONSUMPTION SURVEY TECHNICAL GROUP

Boise State University 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 (RMWL) team, and Ross Strategic to coordinate the state and tribal fish consumption rate surveys. The goal of this group is to share what each survey team is learning about Idaho, discuss common issues surrounding each groups' mission, to develop common core questions and to the extent possible, and share the results of each survey.

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 is to provide guidance on creating comparability between the two initiatives. The second area has been on sample design issues of episodic food consumption with specific focus on the challenges presented with the NCI method⁹. In addition to the scheduled phone conferences, there has been a phone conference between the two teams and the NCI researchers as well as significant email correspondence.

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 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. The group 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.

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 24 phone conference that Boise State University and RMWL 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.

⁹ Ken Ghalambor, Ross Strategic, Draft summary of technical survey design team phone conferences



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.

Common Core Data Elements

The group identified a number of common core data elements. Types of fish consumed, where fish was caught/sourced, and basic demographic information for survey respondents were all discussed as common core elements. 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 with the group. This issue may be of much higher significance to tribes for a number of reasons than for the general Idaho population. The group decided that they would address this issue separately with their clients.

Survey Respondents

The group discussed whether information would be collected by individual or by household unit or both. IDEQ desires to collect data by household, as it will facilitate a phone survey method. 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 and reasons why fish suppression may be occurring. The data collected from the two methods will be comparable.

Statistical Inference

The group discussed a number of issues regarding how to minimize systematic error and provide the maximum likelihood 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. RMWL 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 a 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 re-combine 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 at our end to get a suite of programs in place that you can drop your data into and then retrieve the results.

High Consumption Population

The group discussed how to treat unlicensed recreational anglers. Boise State University relayed their conversations with IDFG to the group 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.

Coding

The group discussed how to coordinate the common core questions with a standardized coding method. It was deemed premature to discuss this issue.

Including Respondents Weight

The group reached a consensus 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 by the group that this information is currently not necessary for the fish consumption survey.

NCI Method Implementation

The group spent considerable time 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, we will have a higher expected yield of recall survey. The group determined that this would introduce a systematic bias and was rejected.



The group inquired whether the current SAS version includes a provision for fewer than 100% of respondents having a second day 24-hour report. When RMWL previously ran the SAS software, those without a second day were dropped. NCI responded that the current software available can handle different people having different numbers of recalls such as people surveyed 3 times, some surveyed twice and some only once. It was noted that this second version of the NCI program will be available soon.

The group discussed whether the NCI software was adaptable to a single episodic food intake model like fish. 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 is 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 and reducing the skew of the distribution curve.

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 2 recalls per person. The likelihood method works well when there are 4 recalls per person. The MCMC is more stable, and works fine with 2 recalls. The Keogh and White methodology uses stronger assumptions so that they can use a likelihood method. The MCMC (and the likelihood) present 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.

FISH AND SHELL FISH IDENTIFICATION

The IDF&G Fisheries Bureau has been surveying anglers about fishing preferences from 1968 through 2011. The purpose of these surveys is for management of sustainable fisheries. The sample of license holders was about 16,000, and the agency received 5,600 completed surveys. The IDF&G 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%)



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4. Bluegill/perch/crappie (50%)
5. Steelhead (42%)
6. Kokanee (36%)
7. Catfish (33%)
8. Chinook salmon (26%)
9. Whitefish (18%)

IDF&G is trying to determine which fish anglers most often target, while IDEQ is interested in the fish that are consumed by Idahoans. There is an overlap between the two agencies but it is not perfect. 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. These results suggest that anglers primarily fish for trout but that 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.

Boise State University 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. Boise State University 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. The categorization process resulted in the Coding Table.



Coding of Fish and Shell Fish Chart - Prompts		
Code	Idaho Fish	Non Idaho Fish
A	All Trout	
B	Chinook, Steelhead, Coho, Kokanee	King, Chinook, Steelhead, Coho, Kokanee
C	Crawfish	
D	White Fish, Pan Fish (Crappie, Pumpkinseed Sunfish).	Smelt, Crappie, Tilapia, Sole/Flounder, Perch, Mackerel, Herring, Anchovies
E	Lake Trout, Bass, Pan Fish, Tiger Muskie, Walleye, Pike Minnow, Carp, Chisel Mouths, Suckers	Cod, Snapper, Rockfish Catfish, Suckers, Bass Carp, Suckers
F	Unknown	Unknown
G	All Roe	All Roe
H		Shark, Swordfish, Tuna Halibut, Sturgeon
I		Littleneck, Soft Shell, Butter, Cockles, Mussels, and Moon Snails
J		Horse, Geoduck, Oysters, Scallops, Abalone
K		Bay, and Shrimp smaller than 26
L		Shrimp larger than 26 and Lobster
M		Quantity in flesh, Dungeness, Snow, King, bBue, Soft-shell
N		Octopus, Squid
O		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. Boise State recommends that the survey use a checkbook as the scale for these codes. 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. Boise State University recommends that a poker style deck of cards can be used as a scale. Codes C, G, I, J, K, L, M and O have the flesh pulled from the shell before consumption and a volume measurement are 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 the respondent choose an appropriate representation of their amount of intake. Boise State University 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 there is no real way of



determining the quantity consumed and a surrogate portion will have to be assigned. Boise State University does not have 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 will provide 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. Boise State University 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. Anglers may or may not know if the trout is a sea run or local fish. Boise State University does not have a recommendation of the coding of sea run trout. Currently the coding table classifies these trout with steelhead but there may be some miscoding due to respondents' answers.

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 duration of the survey which will increase the probability of surveys being completed. The demographic questions included have been vetted with the Fish Consumption Survey Technical group. Boise State University recommends that the following five demographic characteristics to be included in the survey.

1. Gender
2. Age



3. Income
4. Ethnicity
5. Weight

Questionnaire Introduction

The introduction of the questionnaire is important in setting the stage for the respondent. Boise State University recommends that the introduction chosen by the implementing consultant be clear as to 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 Boise State University has provided an example for the firm to consider.

Gender Proportionality

To gain an accurate understanding of fish consumption rates, the questionnaire seeks to select 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. And 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. Boise State 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.

Age Scale

Boise State University recommends that the question that asks 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. Boise State University recommends that the reported ages are coded as ranges. In looking at the Idaho age cohorts, approximately 60 percent of the population is between 18 and 64, 12 percent are over 65 and 27 percent are under 18. With 60 percent of Idahoans between 18 and 64, Boise State recommends that 3 cohorts be established to capture this group. There are ethical issues interviewing under 18 year olds that will have to be covered with the implementing consultant. Boise State University recommends that the survey solicit responses from adults only.



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Subject	United States ¹⁰				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

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, freezers 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 adjustment needs 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.

¹⁰ US Census Bureau, 2010 census, last accessed July 15, 2013, <http://www.census.gov/2010census/>



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2010 US Census INCOME AND BENEFITS (IN 2011 INFLATION-ADJUSTED DOLLARS) ²								
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	114,761,359	(X)	575,497	+/-2,256	575,497	(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)

Boise State University recommends 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.

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. When single race is combined with mixed race the white classification increases to 94 percent. Mixed race reporting may not be a substantial issue. Both the United States and Idaho report that 98 percent report single ethnicity. However Boise State University recommends that the ethnicity question allow for multiple ethnicity responses.

Minority races may difficult to reach. 12 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 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.



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2010 US Census Population Demographics Ethnic Identification ²								
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	*****	306,603,772	(X)	1,549,987	*****	1,549,987	(X)
RACE								
Total population	306,603,772	*****	306,603,772	(X)	1,549,987	*****	1,549,987	(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

As with the other demographic questions, Boise State University recommends that an open-ended approach be used for the question. Boise State University recommends that five classifications of ethnicity - 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.

Weight Scale

The question asking respondents their weight is recommended to be open ended. People will misrepresent their weight for a variety of reasons. Boise State University recommends 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. Boise State University recommends that three groups be used for less than 155 pounds and three groups for over 155 pounds.



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 a respondent consumes the fish. 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 prompt recall with foods that are not normally associated with fish or shellfish. Boise State University recommends that the questionnaire includes 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. Boise State University recommends the survey ask about episodic consumption within a twenty-four hour recall period and within seven days but excluding the last twenty-four hour recall period. 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 was caught. The majority of finfish and shellfish sold at restaurants or at markets do not live in Idaho waters. There is one exception, trout. Boise State University 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 was 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. Boise State University recommends that unless the crawfish source can be identified as Idaho, crawfish be classified as non-Idaho.

Portion Size

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 six and eight 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 the more probable than an inaccurate reflection of the true portion size.

If an in-person interview is used, Boise State recommends a model of a 6 ounce portion of common cut of fish. If an Internet survey is used, photos of 6-ounce and 12 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 that 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.

SURVEY METHODS

Introduction

There are a number of articles that cover the strengths and weakness 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.

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:



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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, and 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 at all times of day and throughout the year must be surveyed to provide comprehensive information.
 4. Suppression rates likely have larger impacts upon anglers than upon the general population.

Dietary 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:
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.



In Person Interviews

This method administers questionnaires in person to respondents who have been randomly selected for participation. The method is frequently used in situations where locations are geographically constrained, when other methods are inappropriate or ethnographic data is being collected.

- 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.

Telephone Surveys

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

Mail Or Internet Surveys

This method entails the self-administration of a questionnaire by respondents who have been randomly selected for participation. This method 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-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-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.

Boise State University recommends that a telephone - Mail Internet method be used.

Bias from Respondent and Researcher

There were a number of questions raised at 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. The introduction of bias through the Internet is lower than the telephone survey. A reputable firm will 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. The Casey¹¹ 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 CSFII¹² data set and their results were consistent with four other studies.

Florida conducted a food recall survey by telephone in 1994¹³. 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

¹¹ See Casey et al.

¹² Continuing Survey of Food Intakes by Individuals, USDA

¹³ See Degner et al.



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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 superficial data collection. The team used a 7 day recall period citing a number of studies that found the seven 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 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. This 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. This is the nature of surveys.

SAMPLE DESIGN

Introduction

The sample design was structured for the data requirements of two statistical models -- the never episodic consumer [NEC] model and the National Cancer Institute ever episodic consumer [NCI] 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 maintaining a daily diary over the course of a year, using a short recall period will minimize the measurement error for a single event. The first challenge occurs in how to collect a second event from the same person to develop a within-person variance. This is required to establish the mean consumption amount for one individual. 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.



Budget and Sample Size

At the end of the day, budgets govern the sample size. The ideal is to survey every person of interest. At this point the estimated mean = true mean. For everything short of this standard we rely on statistics to approximate the true mean. Statistics allow us to sample a relatively small portion of the population and have confidence that the sample accurately reflects the total population. And, we describe the possible deviation of the true mean from the estimated mean. 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.

The 2012 CDC BFRSS survey¹⁴ offers insight into the frequency of Idahoan fish consumption. The study suggests that approximately 80 percent of Idahoans consume fish monthly. This is high enough that capturing 2 recall questionnaires from one respondent is achievable.

Sample Sizes for the Surveys

To determine the sample size needed to estimate a population *proportion* (the percentage of Idahoans or of anglers who ate fish within the last year), we just need to decide upon the confidence interval and confidence level.

$$N = \frac{Z^2 [P_u (1 - P_u)]}{c^2}$$

Where:

N = the sample size required

Z = Z-score desired

c = confidence interval desired

P_u = the population proportion (which we'll assume to be .50, since it produces the most conservative result)

Log Normal Distribution

There have been a number of articles on the shape of the distribution curve for fish consumption. The Ruffle article¹⁵ points out a number of the foundations for making this assumption. 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. It may be possible to have fewer surveys for Idaho anglers.

¹⁴ Idaho Central District Health provided the conclusions from the 2007 survey.

¹⁵ 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



NCI Approach

The National Cancer Institute [NCI] method was developed to measure episodic consumption of food items.¹⁶ 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, the shorter the recall time frame, the more accurate the response, assuming other researcher and respondent biases have been accounted for. However, episodic consumption means that there is a high probability that a survey with a short recall period will under report the episodic consumption. And, samples of this type of data have trouble distinguishing day-to-day variation of an individual's consumption, within-person and the variation of consumption patterns between people, between-person. The NCI method assumes that within-person variance is constant across consumption amounts based on 2 or more 24 hour recall surveys of a single respondent. Then the NCI method uses probabilistic assumptions to fill in the density distribution. Under the central tendency theorem it will be necessary to have approximately 50 to 60 completed double 24 hour recall surveys.

Idaho Population Sample

Flow Chart One walks through the implications of these assumptions. This chart uses $n = 500$ as an example and concludes that for every 500 respondents contacted twice, 6.5 of the respondents will have consumed fish within 24 hours of both contacts. This conclusion is based on the assumption that Idahoans reflect the national average that about 50 percent seldom or never consume fish. This would suggest that 250 respondents will have consumed fish within the last 12 months. Following the flow chart on the left branch with 250 surveys with a positive response of eating fish, this sample includes saltwater and freshwater fish. This example makes the assumption that this 56 percent group will eat fish once during a week based on Dresser's article¹⁷. Dresser also reported that approximately 1.3 percent of total population will consume fish on any one day. The assumption is made that among fish consumers it is assumed that the probability may be doubled. If we assume that there needs to be 15 percent of the population¹⁸ that answers in the affirmative and that 2.6 percent of the fish consumers will answer in the affirmative on two 24 hour recall surveys, it suggests that there needs to be 75 affirmative surveys. The resulting required sample size could exceed 5,000 depending upon the assumptions made about target population.

¹⁶ Janet A. Tooze, PhD, Mph; Douglas Midthune, Ms; Kevin W. Dodd, PhD; Laurence S. Freedman, PhD; Susan M. Krebs-Smith, PhD, Mph, Rd; Amy F. Subar, PhD, Mph, 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.

¹⁷ 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

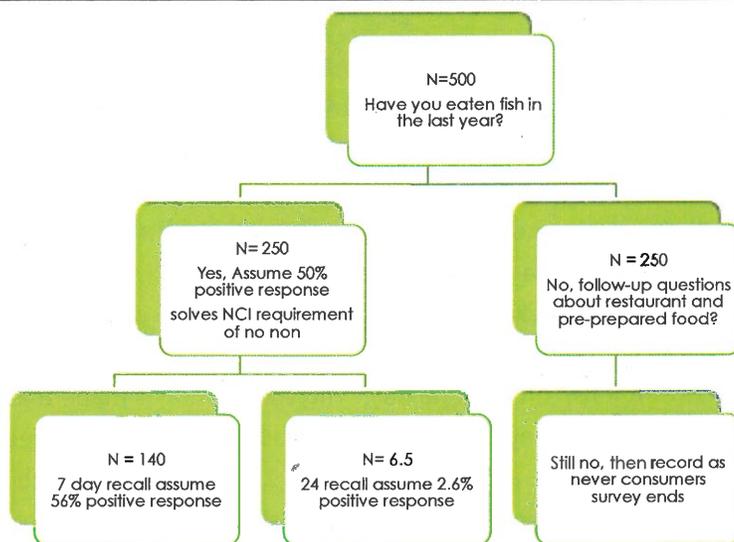
¹⁸ Keogh, Ruth H and Ian R White, "Allowing For Never And Episodic Consumers When Corrector For Error In Food Record Measurement For Dietary Intake", 2011, *Biostatistics*, Vol. 12 No. 4; pp. 624-636



The national statistics may overstate the number of necessary samples to reach the requisite number of double responders. The 2012 IDH&W BRFFS data indicates that Idaho fish consumers may exceed 90 percent of the Idaho population. This would increase the ever eaters to 400. This would increase the potential of having 10.5 respondents answering in the affirmative on two 24 hour recalls. This would reduce the total number of required surveys to 3,000. However the only way to be sure is to over sample.

Flow Chart One

Analysis – The NCI requirements for all fish/shellfish Total Idaho Population



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Idaho Fish Sample

IDEQ seeks to identify the consumption behavior of Idaho fish. 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. Individuals who only eat prepared fish may eat little fresh water finfish. On the other hand Idahoans with a fishing license may consume freshwater finfish at a much higher rate than the national average. Approximately 430,000 Idahoans purchase a fishing license. This group represents about 30 percent of the total Idaho population. Flow Chart Two shows how the sample is impacted if IDEQ is interested in Idaho fish. Using the 30 percent assumption the affirmative surveys drop to 150. The net result is that it will cut the affirmative surveys



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for two 24-hour recalls in half. This would double the required sample to approximately 10,000 interviews.

If budgetary constraints prohibit this large of a sample the tradeoff will be between collecting data from all four seasons and the recall period. For example using a seven-day recall a sample of 500 will provide sufficient surveys that would answer in the affirmative on two surveys. Flow Chart two repeats the example for an estimated sample size for collecting two 24 hour recall surveys from the same person. These values were developed from the 2005 BRFFS data and asked the frequency that Idahoans consumed Idaho fish. If the national NHANES survey is used for number of ever eaters this would require over 11,000 surveys. If a seven day recall is used it drops this sample size to 3,000.

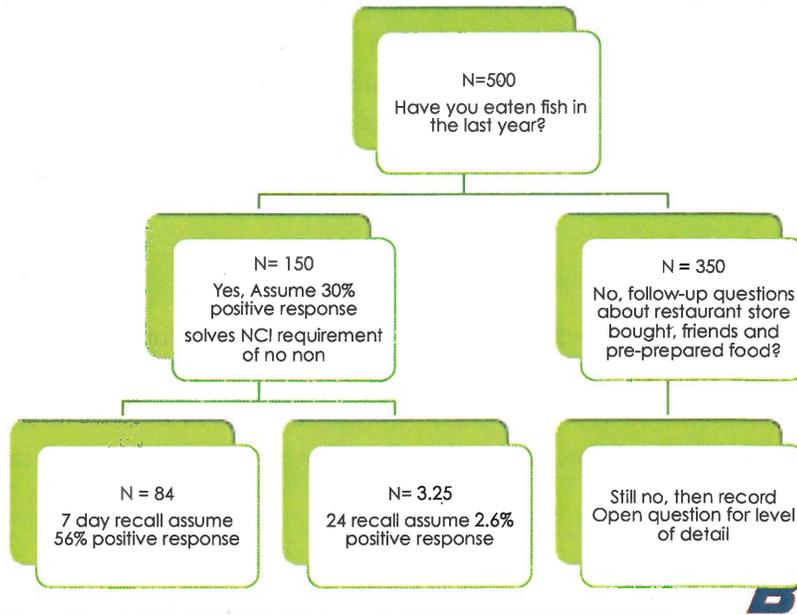
Minimizing Sample Size

It is difficult to estimate the number of recalls that will occur. Boise State University recommends that the first survey use the higher end of the sample draw. The completed surveys should be analyzed on 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.



Flow Chart Two

Analysis – The NCI requirements for Idaho fish/shellfish Total Idaho Population



CONCLUSION

The Public Policy Center at Boise State University 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 Public Policy Center 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, we have been mindful of the difficulties in establishing confidence intervals to estimate the amounts of fish and shellfish eaten by high consumers, have addressed the problems that can arise as a



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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. The Public Policy Center 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. We recommend a mailing to identify those willing to participate in this survey, which will be conducted both by telephone as well as over the internet. Given that this will be the first attempt to identify high consumers in the state precise determination of the sample size required is impossible, but the Public Policy Center recommends that in order to satisfy the analytical demands of the NCI method of estimation of food frequency consumption, that IDEQ be prepared to sample as many as 7,000 respondents. We are recommending that 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, reducing the sample size and the cost of implementing the survey significantly. Once conducted, the research methodology and questionnaire we have proposed will offer a quality data set that can be subjected to a wide range of statistical analyses, including the NCI method. The Public Policy Center suggests that this approach will produce data that will enable IDEQ to determine the fish and seafood consumption rates of the Idaho population of sufficient precision to enable defensible water quality criteria.



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APPENDIX A - TERMINOLOGY

There are a number of technical terms that have definitions that are more precise than used in every day conversations. The following annotated glossary contains terms that 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 has repeatedly been disproved making this assumption a theorem.

Common core questions 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

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 $X = x_1 + x_2 + \dots + x_n / n$.



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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 a mixed method uses the same survey instrument (questionnaire) and collects responses by different methods, such as in person interviews and telephone.

Minority population in Idaho is small. With approximately 83 percent 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-hr recall surveys.

Never fish consumer is a true non-fish eater.

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

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 fishes in Idaho without an IDFG fishing license

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 of a household who answers the phone and agrees to take the survey.

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



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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. 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 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, population that the researcher is interested in modeling.

TMT, telephone mail telephone survey method

TMI, Telephone Mail Internet survey method

24hr 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 term describes the variation in the amount of fish consumed by the same person over two 24-hour recall survey.



APPENDIX B - QUESTIONIRE

Preface (not part of the Questionnaire)

Why a Fish Consumption Survey: In order 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 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 to 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 Tables

Coding of Fish and Shell Fish Chart - Prompts		
Code	Idaho Fish	Non Idaho Fish
A	All Trout	
B	Chinook, Steelhead, Coho, Kokanee	King, Chinook, Steelhead, Coho, Kokanee
C	Crawfish	
D	White Fish, Pan Fish (Crappie, Pumpkinseed Sunfish).	Smelt, Crappie, Tilapia, Sole/Flounder, Perch, Mackerel, Herring, Anchovies
E	Lake Trout, Bass, Pan Fish, Tiger Muskie, Walleye, Pike Minnow, Carp, Chisel Mouths, Suckers	Cod, Snapper, Rockfish Catfish, Suckers, Bass Carp, Suckers
F	Unknown	Unknown
G	All Roe	All Roe
H		Shark, Swordfish, Tuna Halibut, Sturgeon
I		Littleneck, Soft Shell, Butter, Cockles, Mussels, and Moon Snails
J		Horse, Geoduck, Oysters, Scallops, Abalone
K		Bay, and Shrimp smaller than 26
L		Shrimp larger than 26 and Lobster
M		Quantity in flesh, Dungeness, Snow, King, bBue, Soft-shell
N		Octopus, Squid
O		Sea Urchin, Sea Cucumber etc.



7A

What type of fish or seafood did you consume [in the first of these meals, if more than one meal]? PROMPTS IF NECESSARY RESPONDENTS DOES NOT KNOW WHAT TYPE OF FISH THEY ATE, GO TO #

		MEAL ONE	MEAL TWO	MEAL THREE	MEAL FOUR
A	Trout				
B	Salmon & Steelhead				
C	Crawfish				
D	Pan size fish				
E	Large Fillet				
F	UNKNOWN				
G	All roe				
H	Steak or Fillet				
I	Small clams				
J	Large clams				
K	Small invertebrates				
L	Large invertebrates				
M	crab				
N	Cephalopods				
O	Other seafood				



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Paper Version Of Questionnaire

SURVEY INSTRUMENT FOR IDEQ DRAFT 09/16/2013

Survey Coding Sheet for Idaho FCS Interviewers code -----

1. 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. 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.]		FIRST SURVEY	<input type="checkbox"/> Y <input type="checkbox"/> N	Respondent ID	_____
		SECOND SURVEY	<input type="checkbox"/> Y <input type="checkbox"/> N	Phone Number	_____-_____-_____-
		THIRD SURVEY	<input type="checkbox"/> Y <input type="checkbox"/> N	RECALL SURVEY	_____
		FOURTH SURVEY	<input type="checkbox"/> Y <input type="checkbox"/> N	FIRST NAME OF RESPONDENT	_____
INTERVIEWER SUMMARY NOTES	Date Called RECALLED	TRY 1	TRY 2	TRY 3	
		DATE _/_/___	DATE _/_/___	DATE _/_/___	
	Interview time	<input type="checkbox"/> AM <input type="checkbox"/> PM	<input type="checkbox"/> AM <input type="checkbox"/> PM	<input type="checkbox"/> AM <input type="checkbox"/> PM	
	Date Called RECALLED	TRY 4			
		DATE _/_/___			
	Interview time	<input type="checkbox"/> AM <input type="checkbox"/> PM			
	1. Completed interview <input type="checkbox"/> Y <input type="checkbox"/> N	2. No answer <input type="checkbox"/> Y <input type="checkbox"/> N	3. Other	DO NOT CONTACT	
1A	Are you over 18 years of age, and a current resident of this household? IF NO ASK IF ANOTHER PERSON OVER 18 IS AVAILABLE OTHERWISE INTERVIEW CURRENT RESPONDENT IF OVER 18. IF FEMALE ANSWERS AND A MALE IS NEEDED ASK IF THERE IS A MALE OVER 18 AVAILABLE TO ANSWER THE PHONE, OTHERWISE INTERVIEW CURRENT RESPONDENT IF OVER 18.	Male	Female	Request for another adult	Call terminated
		OVER 18 <input type="checkbox"/> Y <input type="checkbox"/> N	OVER 18 <input type="checkbox"/> Y <input type="checkbox"/> N		
1B	Would you be willing to help us with this?	Yes, go to 2A	No, go to 1C	Other	No adult home
1C	If NO, is there a better time we could call you back?	Yes, record time and date to call back and first name. No, CALL TERMINATED			



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2A	Have you eaten fish or seafood in the last year?	Yes go to #3	No PROMPT & go to #2B	Other CALL TERMINATED
----	--	--------------	-----------------------	--------------------------

IF NO OR DON'T RECALL THEN PROMPT When asked about fish or seafood, sometimes people will forget about things like pizza with anchovies, bagels and lox, tuna or other fish sandwiches, fish and chips, clam chowder, tuna or other seafood casseroles, sardines, pickled herring, smoked fish, seafood salad, and the like.

2B	IF STILL NO THEN ASK Have you eaten within the last year any of the following foods? [2B] CHECK FOR EACH FOOD			
----	--	--	--	--

	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 #17				

3	How often would you say on average you eat fish or seafood? You may provide your answer in number of times per week, month or year.	CHECK FOR YES	NUMBER OF TIMES
	Times a week:		
	Times a month:		
	Times a year:		
	If simply a yes or no or indefinite		

24 HOUR RECALL

4A	Have you eaten fish or seafood in the last 24-hours? REMEMBER TO THINK ABOUT BREAKFAST SNACKS LUNCH OR DINNER, AT RESTURANTS OR SOCIAL GATHERING	YES CONTINUE	NO [SKIP TO #9]
----	--	--------------	--------------------

5A	In the last 24-hours, did you have fish or seafood for more than one meal?	YES	NO
----	--	-----	----

5B	IF YES AND PROMPTING IS NEEDED HOW MANY MEALS DID YOU HAVE FISH OR SEAFOOD	NUMBER OF MEALS	
----	--	-----------------	--



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24 HOUR RECALL CONTINUED

6A	Where did you acquire this fish or seafood [in the first of these meals, if more than one meal]? PROMPTS IF NECESSARY?	Caught in Idaho waters, by yourself or a member of your household, or received as a gift caught in Idaho waters.	Not caught in Idaho waters, i.e. received as a gift, purchased in a market or at a restaurant.	Unknown		
	MEAL ONE					
	MEAL TWO					
	MEAL THREE					
	MEAL FOUR					
7A	What type of fish or seafood did you consume [in the first of these meals, if more than one meal]? PROMPTS IF NECESSARY	USE CODED TABLE 7A				
	PROMPT IF RESPONDENTS DOES NOT KNOW WHAT TYPE OF FISH THEY ATE, REFER TO CODING TABLE					
	MEAL ONE					
	MEAL TWO					
	MEAL THREE					
	MEAL FOUR					
8A	How was the fish or seafood meal you ate prepared?	Raw (e.g. sushi)	Cooked (baked, fried, boiled, broiled, fried)	Canned or Pickled	Dried, smoked or salted	Other
	MEAL ONE					
	MEAL TWO					
	MEAL THREE					
	MEAL FOUR					



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9A About what size was the portion you ate? [FOR EACH SUCCESSIVE MEAL IDENTIFIED IN 5B]? USE PROMPTS IF THEY DO NOT GIVE PORTION SIZE IN WEIGHT
 IF PAN FISH OR TROUT; Would you say that you ate one filet [one side of the fish]?
 IF LARGER FISH SALMON HALIBUT; Would you say that you ate one or more deck of cards? How about the thickness of the portion would you say it was 1/2 inch or one deck thick? How long? So the total number of cards would be [FEED BACK HOW MANY YOU THINK IT IS
 IF SHELLFISH WITHOUT SHELL; Would you say that you ate one cup more or less of ****
 IF SHELLFISH IS WITH SHELL [SHRIMP EXCLUDED] ; Would you say that you ate one quart more or less

	NUMBER OF CHECKBOOKS ONE CHECKBOOK FOR 0 OZ	NUMBER OF DECKS OF CARDS ONE DECK OF CARDS FOR X OZ	NUMBER OF CUPS = 6 Oz can WITHOUT SHELL ONE CUP IS X OZ FOR SHRIMP, X OZ FOR CRAB	NUMBER OF QUARTS IF IN SHELL ONE QUART IS X OZ FOR CLAMS X OZ FOR LOBSTER TAILS
MEAL ONE				
MEAL TWO				
MEAL THREE				
MEAL FOUR				

SEVEN DAY RECALL

9A Now thinking back over the last week, excluding yesterday, did you consume any fish or seafood? YES NO

9B IF YES AND PROMPTING IS NEEDED HOW MANY MEALS DID YOU HAVE FISH OR SEAFOOD NUMBER

Where did you acquire this fish or seafood [in the first of these meals, if more than one meal]? PROMPTS IF NECESSARY?	Caught by yourself or a member of your household in Idaho waters.	Received as a gift, caught in Idaho waters.	Received as a gift, Purchased in a market, Purchase at a restaurant, or Not caught in Idaho waters.	Unknown
MEAL ONE				
MEAL TWO				
MEAL THREE				
MEAL FOUR				
MEAL FIVE				
MEAL SIX				
MEAL SEVEN				
MEAL EIGHT				



10A	What type of fish or seafood did you consume [in the first of these meals, if more than one meal]? PROMPTS IF NECESSARY FROM CODING TABLE	USE CODED TABLE 7A		
	MEAL ONE			
	MEAL TWO			
	MEAL THREE			
	MEAL FOUR			
	MEAL FIVE			
	MEAL SIX			
	MEAL SEVEN			
	MEAL EIGHT			

11A	How was the fish or seafood meal you ate prepared?	Raw (e.g. sushi)	Cooked (baked, fried, boiled, broiled, fried)	Canned or Pickled	Dried, smoked or salted	Other
	MEAL ONE					
	MEAL TWO					
	MEAL THREE					
	MEAL FOUR					
	MEAL FIVE					
	MEAL SIX					
	MEAL SEVEN					
	MEAL EIGHT					



11B About what size was the portion you ate? [FOR EACH SUCCESSIVE MEAL IDENTIFIED IN 5B]? USE PROMPTS IF THEY DO NOT GIVE PORTION SIZE IN WEIGHT
 IF PAN FISH OR TROUT; Would you say that you ate one filet [one side of the fish]?
 IF LARGER FISH SALMON HALIBUT; Would you say that you ate one or more deck of cards? How about the thickness of the portion would you say it was ½ inch or one deck thick? How long? So the total number of cards would be [FEED BACK HOW MANY YOU THINK IT IS
 IF SHELLFISH WITHOUT SHELL; Would you say that you ate one cup more or less of ****
 IF SHELLFISH IS WITH SHELL [SHRIMP EXCLUDED]; Would you say that you ate one quart more or less

	NUMBER OF CHECKBOOKS ONE CHECKBOOK FOR 0 OZ	NUMBER OF DECKS OF CARDS ONE DECK OF CARDS FOR X OZ	NUMBER OF CUPS WITHOUT SHELL ONE CUP IS X OZ FOR SHRIMP, X OZ FOR CRAB	NUMBER OF QUART IF IN SHELL ONE QUART IS X OZ FOR CLAMS X OZ FOR LOBSTER TAILS
MEAL ONE				
MEAL TWO				
MEAL THREE				
MEAL FOUR				
MEAL FIVE				
MEAL SIX				
MEAL SEVEN				
MEAL EIGHT				



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12	THE NEXT THREE QUESTIONS ARE ABOUT YOUR REASON FOR EATING OR NOT EATING FISH OR SHELLFISH		
12A	Some people eat more fish or seafood than others, for a variety of reasons. Among these reasons are things like [read list]. Would you say that any of these apply to you? MAY SELECT MORE THAN ONE a. Health benefits. b. It is readily available. c. I enjoy cooking with fish and seafood. 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 seafood. g. Fish or seafood is important to me culturally. h. Other i. None of these apply to me; I neither favor or disfavor fish or seafood over other food choices.	CHECK ALL APPROPRIATE REASONS YES	NO
13A	Some people have to, or try to, limit their fish or seafood consumption, or do not eat fish or seafood at all, for a variety of reasons. Among these reasons are [read list], do any of these apply to you? MAY SELECT MORE THAN ONE 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	CHECK ALL APPROPRIATE REASONS YES	NO



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15	To conclude the survey, we'd like to ask a few questions about you.		
	IF RECALL SURVEY THIS IS THE END OF THE SURVEY MAY WE CALL YOU ONE (TWO MORE TIMES) OR THANK YOU FOR YOUR TIME		
15A	What is your approximate age?	Check the appropriate fields	Age
	a. 18-24		
	b. 25-34		
	c. 35-44		
	d. 45-54		
	e. 55-64		
	f. 65 or over		
16A	30. Of which ethnic group or groups are you a member?	Check the appropriate fields	
	a. White [SKIP to #23]		
	b. Hispanic [SKIP to #23]		
	c. African-American [SKIP to #23]		
	d. Asian American or Pacific Islander [SKIP to #23]		
	e. Native American or Alaska Native		
	f. Other [SKIP to #23]		
17A	31. 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		
18A	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.] NEED TO CLARIFY HOUSEHOLD OR INDIVIDUAL OR BOTH FIRST INDIVIDUAL IF NOT WORKING HOUSEHOLD	Individual Income	Household Income
	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		



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19A	How much formal education have you completed? What is your highest degree earned? FOR THE INDIVIDUAL	Check the appropriate field	
	a. Did not complete High School		
	b. High School diploma or GED		
	c. Attended some college		
	d. Associates degree or technical certificate.		
	e. Bachelor's degree		
	f. Master's degree		
	g. Doctoral degree (including medicine and law)		
20A	Approximately how much do you weigh? [Purpose: To establish the average portion size relative to weight for the population.] FOR THE INDIVIDUAL	Check the appropriate field	Weight
	a. Less than 115 pounds		
	b. Between 115 and 134 pounds		
	c. Between 135 and 154 pounds		
	d. Between 155 and 174 pounds		
	e. Between 175 and 194 pounds		
	f. Between 195 and 224 pounds		
	g. 225 pounds or more		
	h. Prefer not to respond		
21A	We'd also like to find out if there is variation in fish and seafood consumption around the state. What are the first three digits of your zip code?		Zip code
22A	Finally, have you or any member of your household held an Idaho fishing license in the last year (or a combined hunting/fishing license)?	a. Yes	b. No
23A	ASK ONLY RESPONDENTS WHO ANSWERED yes to #4 or #9 We are going to be calling some of our participants again, to gather more data on this issue. Would you be willing to allow us to call you again in a few months and ask you these questions a second time?	a. Yes	b. No
24A	MAY WE HAVE A FIRST NAME SO WE MAY ADDRESS YOU WHEN WE NEXT CALL	a. Yes	b. No NAME
CLOSE: That concludes the survey, thank you very much for your help with this.			



APPENDIX C IDHW BRFFS DATA

Percent of Idaho Adults Who Ate Fish At Least Once a Month*,
2012 BRFFS

	%	Lower CI	Upper CI	n
Statewide	78.0	75.9	80.0	5410
Sex				
Males	78.3	74.9	81.4	2131
Females	77.8	75.1	80.2	3279
Low SES				
Not Low SES	82.2	79.4	84.7	2295
Low SES	71.6	66.3	76.4	874
Ethnicity				
Hispanic	79.0	76.8	80.9	5135
Non-Hispanic	68.1	57.7	76.9	224
Race (non-hispanic)				
White	78.9	76.8	80.9	4964
AI/AN	90.1	77.7	95.9	63
Interview Month				
Jan	70.7	62.8	77.5	482
Feb	76.4	67.9	83.2	447
March	78.0	69.7	84.6	442
April	76.5	68.9	82.7	446
May	75.8	67.2	82.7	453
June	84.0	75.6	89.9	417
July	77.8	70.5	83.7	473
August	75.2	67.2	81.8	454
Sep	91.8	88.3	94.2	427
Oct	78.5	70.6	84.7	423
Nov	82.4	75.8	87.5	425
Dec	76.7	70.1	82.3	521

*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.



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Percent of Idaho Adults Who Ate Fish Caught In Idaho Waters At Least Once a Month*, 2012 BRFSS

	%	Lower CI	Upper CI	n
Statewide	17.1	15.3	19.0	4634
Sex				
Males	20.0	17.1	23.1	1885
Females	14.3	12.2	16.6	2749
Low SES				
Not Low SES	16.3	13.9	18.9	2039
Low SES	16.3	12.7	20.7	741
Ethnicity				
Hispanic	17.2	15.3	19.2	4408
Non-Hispanic	15.5	9.8	23.8	182
Race (non-Hispanic)				
White	17.3	15.4	19.3	4271
AI/AN	31.3	16.3	51.6	58
Interview Month				
Jan	14.0	9.1	21.1	416
Feb	13.5	9.5	18.9	362
March	14.5	9.5	21.3	381
April	19.2	13.6	26.4	387
May	17.8	12.0	25.6	388
June	21.1	14.7	29.3	355
July	18.4	12.3	26.5	404
August	19.4	13.8	26.7	393
Sep	24.6	16.8	34.5	370
Oct	13.3	9.0	19.3	364
Nov	15.2	10.5	21.5	375
Dec	16.5	11.7	22.7	439

*Among Those Who Ate Fish in the Past Year



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Percent of Idaho Adults Who Ate Fish* In the Last Year, 2012 BRFSS				
	%	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
Age and Sex				
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



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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>				

DRAFT



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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
Age Group				
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
Income				
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



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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.

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APPENDIX D IMAGES

Examples of fish images

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APPENDIX E – NCI DISCUSSION NOTES

The NCI method

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), Erik Lindquist, David Everly (BOISE STATE UNIVERISTY), 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)

Dr. Amy Subar and Dr. 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/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; so 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?



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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 a while, 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.



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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



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Dr. Subar and Dr. Dodd expressed their willingness to work with BOISE STATE UNIVERISTY 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.



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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

Introduction

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 insure 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 before they contact for surveys they have not passed away.



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.



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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.



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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



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