Nonsampling Errors
Sampling Designs Used in States and MRIP

• We have two kinds of approaches used in the states:
  • Capture-recapture: probability sample with ratio estimator (single intercept sample with additional auxiliary data from reports)
  • Probability samples with product estimator (independent effort and intercept samples)

• They both have specific types of non-sampling errors they are vulnerable to.

• Some are in common and some are unique to the estimator type
Links to Target Population

Target population = anglers

Sampling frame for effort samples
  • License list (various modes) vs. household (mail survey)
  • Different age restrictions for license, quality / timeliness of information by state

Sampling frame for intercept samples
  • Landing sites x times (pressure measured consistently across states?)
Types of Nonsampling errors that may affect one or more state surveys

- **Coverage error** (both)
- **Nonresponse error** (both are vulnerable but most serious for effort survey and product estimator)
- **Measurement error** (both but most serious—or perhaps just easier to identify—for effort survey and product estimator)
- **Matching error** (only affects capture-recapture estimator)
- **Independence assumption failure** (only affects capture-recapture estimator)
Coverage Error

• Undercoverage: some target population units do not have a link to any unit in the frame.
  • Example: unlicensed anglers for those using a license frame
• Overcoverage: some units in the frame are not in the target population.
• Multiplicity: some target population units have links to more than one frame object.

Possible Remedy: calibration/post-stratification adjustment
Nonresponse Error

• Nonresponse means the desired data are not obtained for the entire set of sample elements.
  • Examples: angler unwilling to participate
• Consequence of nonresponse: missing data
• Are respondents similar to the nonrespondents???

\[
\text{Nonresponse Bias (} Y_{\text{NR}} \text{)} = \lambda (\overline{Y}_{\text{NR}} - \overline{Y}_R)
\]

\[
\lambda = \text{nonresponse rate}
\]
Survey Response Rates and Sample Design: It is expected that data collections based on statistical methods will have a response rate of at least 75 percent. Proposed data collections having an expected response rate of less than 75% require a special justification. Data collection activities having a response rate < 50% should be terminated.
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Survey Response Rates: Agencies must design the survey to achieve the highest practical rates of response...to ensure that survey results are representative of the target population. Nonresponse bias analyses must be conducted when unit of item response rates or other factors suggest the potential for bias to occur.
Calculation of Response Rate

• Refer to the American Association of Public Opinion Research website (AAPOR)
  https://www.aapor.org/
  - Under folder called Education/resources

• Excel program available to compute response rates

  Remedy: calibration/post-stratification adjustment
Types of Measurement Error

1. Data processing errors
2. Data collection errors
3. Response error
4. Questionnaire
   - Questionnaire differs between states and FES
5. Mode of data collection
   - Differences among states
Matching error

• The capture recapture estimator requires that each intercepted trip must be classified as having reported or not, and if reported, what reported catch was. This requires a matching process.

• There are three kinds of matching error:
  • A false positive matches a non-reporting intercepted trip to a trip report.
  • A false negative fails to match a reporting intercepted trip to any trip report.
  • A mismatch matches a reporting intercepted trip to the wrong trip report.

• These errors can cause bias, especially false positive (causes ↓ bias) and false negative (causes ↑ bias).

• Solution: Improve matching process to prevent errors

• If this is not possible then measure rates of false + and false – to assess impact of errors on bias.
Failure of independence assumption

• If intercepted anglers report differently than non-intercepted anglers, then we can’t assess the population accurately from the intercept sample.
  • If they report at a higher rate, then estimate of catch is biased.
  • If they report at a lower rate, then estimate of catch is biased.

• Solution: Require anglers to report before they are aware they are intercepted.

• If this is not possible, then to measure the effect of knowing about interception in advance, you must be able to answer:
  • What fraction know about interception in advance?
  • How does their reporting behavior change, both reporting rate and accuracy?
Example of the impact of lack of independence on bias of catch estimate.
Data Generating Process

Measurement:
- Construct Questions
- Collect Responses
- Edited Response

Representation:
- Population Estimates
- Sampling Frame
- Sample
- Respondents
- Postsurvey Adjusted Data

Measurement:
- Specification
- Coverage
- Sampling
- Nonresponse
- Adjustment

Groves et al. 2004