NATIONAL CORAL REEF MONITORING PROGRAM

Standard Operating Protocol

For

Socioeconomic Data Collection

Editors: NCRMP Socioeconomic team, Coral Reef Conservation Program and National Centers for Coastal Ocean Science

NOAA CORAL REEF CONSERVATION PROGRAM

https://www.coris.noaa.gov/monitoring/socioeconomic.html

National Coral Reef Monitoring Program

Socioeconomic Data Collection Protocols

The socioeconomic component of NCRMP collects and monitors socioeconomic information, including human use of coral reef resources, knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal of the socioeconomic monitoring component is to track relevant information regarding each jurisdiction's resident population and understand how human connections to coral reefs are changing over time.

Socioeconomic data are collected in each of the seven inhabited U.S. coral reef jurisdictions every 5-7 years (Table 1).

Table 1: Schedule of NCRMP socioeconomic survey monitoring cycles

	Cycle 1	Cycle 2	Cycle 3
American Samoa	2014	2021	2028
Florida	2014	2019	2026
Hawai'i	2015	2020	2027
Puerto Rico	2015	2022	2029
Guam	2016	2023	2030
CNMI	2016-2017	2024	2031
USVI	2017	2025	2032

Target population: The potential respondent universe in each of the jurisdictions are adult household residents aged 18 years or older.

A stratified sampling methodology is used for all seven jurisdictions, and sample sizes are selected proportionately across strata/sub-strata to allow for the estimation of jurisdiction-level parameters. A random subset of households is selected from each stratum and one residing individual (18 years or older) is randomly selected from each household. Multiple members of a household are not surveyed because this can diminish the precision of estimates, as a consequence of homogeneity within the household (Cochran, 1977; Kish, 1949).

The data are collected through a standardized survey instrument administered via in-person, online, telephone, or a mixed-mode approach.

All data are weighted to U.S. Census population metrics and are representative of the jurisdiction and sublevel strata.

- The sampling population is stratified geographically based on partner input and local management needs. Adequate sample sizes for the strata are necessary to ensure that they are representative and are important for statistical power and meaningful analyses of subgroup data. Sample sizes must be calculated to ensure a 95% confidence level and a 5% confidence interval using the standard formula for a stratified population:

$$n = \frac{[t^2\ N\ p(1-p)]}{[t^2\ p(1-p) + \alpha^2\ (N-1)]}$$

where *n* is the sample size, *N* is the size of the total number of cases, *α* is the expected error, *t* is the value taken from the t-distribution corresponding to a certain confidence interval, and *p* is the proportion of the population.

Based on the calculated sample size, the following formula is used to determine the margin of error, *c*, for each jurisdiction and stratum:

$$c = z\sqrt{\frac{p(1-p)}{n}}$$

where *z* is the critical z-value (here, 1.96 at 95% CI), *p* is the sample proportion of the population (here, 0.5), and *n* is the sample size. Since there are multiple variables of interest, the sample proportion is set at 0.5 to provide the most conservative (largest) sample size. The final sample sizes are determined based on the margin of error, as well as jurisdictional partner needs (for example, desired resolution of the data).

- The size of the population (*N* in the above equation) should be verified by consulting the latest estimates from the U.S. Census. *Every effort must be made to obtain the calculated sample size*.
- Jurisdictional partners will be engaged prior to data collection for feedback related to: a) optional sub-strata for increased spatial resolution, b) preferred or recommended survey mode, and c) jurisdiction-specific items on the survey instrument.

Methods designed to maximize survey response rates are employed at every phase of the data collection effort. Each survey was designed to be completed in no longer than 20 minutes. Standard protocols are taken to minimize bias and reduce error across the survey modes. Surveys are also translated and administered in multiple languages to address any potential issues with language barriers as a cause of nonresponse.

Survey Data Collection

A standard survey instrument uses a core set of survey questions that is consistent across all locations, but also includes a set of jurisdiction-specific questions to assess local management issues. All NCRMP surveys must be cleared through the Federal Office of Management and Budget's (OMB) Paperwork Reduction Act (PRA) process. To date, NCRMP surveys utilize a tri-annual Hybrid-Generic clearance mechanism (OMB Control Number 0648-0646) with the addition of annual, jurisdictional clearances.

Information will be collected in the most effective and efficient manner possible, adhering as closely as possible to the *Tailored Design Method* as described by Dillman et al. (2014) for mail, telephone, internet, and mixed-mode surveys.

- In **American Samoa**, the survey will be conducted in person and offered in Samoan and English. At a minimum, surveys will be conducted on the islands of Tutuila and Manu'a. For the island of Tutuila, surveyed villages are to be selected randomly from 4 geographic categories (East, West, Northeast, and Northwest) and 3 urbanization categories (Rural, Semi-Urban, and Urban). Permission to survey should be sought from the Office of Samoan Affairs (OSA). Upon approval from the OSA and village selection, surveyors should inform each village mayor in the sample pool about the survey effort.
- In **Guam**, **Puerto Rico**, **United States Virgin Islands**, and the **Commonwealth of the Northern Mariana Islands**, surveys will be conducted in person, with online supplementation when appropriate.
    - In **Guam**, the survey will be conducted in English and up to three additional languages determined by jurisdictional partners. Results must be representative of the island of Guam, with optional additional stratification.
    - In **Puerto Rico**, the survey will be conducted in English and Spanish. Results must be representative of all islands of the Commonwealth of Puerto Rico, and may be stratified by coastal and inland populations.
    - In the **United States Virgin Islands**, the survey will be conducted in English and up to two additional languages. Results must be representative of the islands of St. Croix, St. Thomas, and St. John, with optional additional stratification.
    - In the **Commonwealth of the Northern Mariana Islands**, the survey will be conducted in English, Carolinian, Chamorro, and Chinese Mandarin. Results must be representative of the islands of Saipan, Tinian, and Rota, with optional additional stratification.
- In **Florida** and **Hawai'i**, surveys will be conducted online with telephone supplementation when appropriate.
    - In **Florida**, the survey will be offered in English and Spanish. Results must be representative of the counties of Monroe, Miami-Dade, Martin, Broward, and Palm Beach, with optional additional stratification.
    - In **Hawai'i**, the survey will be conducted in English, at a minimum. Results should be representative of the islands of Oʻahu, Hawaiʻi, Maui, Kauaʻi, Molokaʻi, and Lanaʻi, with optional additional stratification; however, Molokaʻi and Lanaʻi may be substituted for greater stratification within Oʻahu, Hawaiʻi, or Maui.

Daily tracking of response rates per sampling domain and strata shall include:

- Number of completed surveys
- Survey item non-response (required only for the first 100 completed surveys)
- Average, minimum, and maximum interview length (minutes)
- Number of eligible households, broken down by 1) survey completed, 2) refusal, 3) return visit required
- Number of ineligible households (e.g., non-residential, abandoned)

- Number of households skipped (not due to sampling design; e.g., safety concerns, inclement weather, gated access)
- Current response rates
- Summary of non-response questions

Data Weighting

After data collection, all data are weighted using population metrics from their respective strata. This means that weighted data are representative of their individual strata as well as the general population when strata are combined. Two final sampling weights will be developed to meet the analytic objectives of this study: a person-level weight and a household-level weight. The procedure used to determine the final sampling weights will have three primary steps:

1. computation of the base weight,
2. computation of a nonresponse adjustment factor (raking), and
3. computation of a post-stratification adjustment factor using 2020 Census population control totals for key demographic variables at the household- and individual-level (such as sex, age, and race/ethnicity).

The weighting plan must include any necessary procedures to produce weights at each stage of sample design. An analysis of weight variability is required, as is the potential for trimming. Final weights must sum to the population total.

Data Cleaning and Archival

Final datasets will be cleaned and prepared for archival. Each respondent is assigned an ID number and the data are scrubbed of any personally identifiable information (PII). Anything that allows a reader to identify (or potentially identify) a respondent needs to be removed or re-coded. The dataset will be accompanied by a codebook or data dictionary defining the variables and data codes. The final dataset is then archived with the National Centers for Environmental Information (NCEI) and made publicly available.

Data Calculations

The majority of the variables collected are continuous, using 5-point Likert scales to approximate normality so that means and standard errors can be estimated for each variable. Scales with five response values and a distribution that is approximately normally distributed in the population sampled are considered continuous variables (Morgan et al., 2006; Revilla, Saris, & Krosnick, 2014). It is a common and widely accepted practice in social science to use these scales in parametric statistics (Baker, Hardyck, & Petrinovich, 1966; Borgatta & Bohrnstedt, 1980; Gaito, 1980; Havlicek & Peterson, 1977; Kempthorne, 1955; Vaske, 2008). Binary and categorical variables are also used to segment the data into subgroups (e.g., by activity participation or strata) and test for mean differences between variables of interest (e.g., resource conditions or topics of awareness).

Frequency distributions (counts, percentages, bar graphs/histograms) were examined for normality and the extent to which the data were skewed. Cross-tabulations (*n*-way) were an

initial examination of the relationship between two or more variables. The *Pearson chi-square* (X^2) was used to test the hypothesis that the row and column variables are independent of each other (for example, $p \leq .05$; .01, or .001). This test for independence evaluates statistically significant differences between proportions for two or more groups/variables,

$$x^2 = \sum \frac{(f_0 - f_e)^2}{f_e}$$

where f_o is the observed frequency in each cell and f_e is the expected frequency for each cell.

Disclaimers and Caveats:

- Due to the sampling design, NCRMP data are meant to be summarized at the strata or jurisdiction level. It is not possible to calculate a robust estimate of an indicator value within a custom area.
- NCRMP socioeconomic surveys are conducted in each jurisdiction every 5-7 years. Sometimes due to weather or other data collection interruptions, surveying has extended beyond the intended years. Data are presented under the year in which surveying began. See archived data for actual sampling dates.
- Strata-level data are not available in every survey year of a jurisdiction, so strata comparability between survey cycles is not always possible.
- In addition to the data presented here, NCRMP socioeconomic data also include a wider range of survey questions and variables. See archived data for full questionnaires and datasets.

References

Baker, B.O., Hardyck, C.D., & Petrinovich, L.F. (1966). Weak measurements vs. strong statistics: An empirical critique of S. S. Steven's proscriptions on statistics. Educational and Psychological Measurement, 26, 291-309.

Borgatta, E.F., & Bohrnstedt, G.W. (1980). Level of measurement: Once over again. Sociological Methods & Research, 9(2), 147-160.

Cochran, W.G. (1977). Sampling techniques, 3rd edition. New York: John Wiley & Sons.

Dillman, D. A., Smyth, J., & Christian, L. (2014) Internet, Mail and Mixed-Mode Surveys: The Tailored Design Method. New York: John Wiley & Sons.

Gaito, J. (1980). Measurement scales and statistics: Resurgence of an old misconception. Psychological Bulletin, 84, 564-567.

Havlicek, J.E., & Peterson, N.L. (1977). Effect of the violation of assumptions upon significance levels of the Pearson r. Psychological Bulletin, 84, 373-377.

Kempthorne, O. (1955). The randomization theory of experimental inference. Journal of the

American Statistical Association, 50, 946-967.

Kish L. (1949). A procedure for objective respondent selection within the household. Journal of the American statistical Association, 44(247), 380–387.

Morgan, G.A., Gliner, J.A., & Harmon, R.J. with Kraemer, H.C., Leech, N.L., & Vaske, J.J. (2006). Understanding and evaluating research in applied and clinical settings. Mahwah, NJ: Lawrence Erlbaum Associates.

Revilla, M. A., Saris, W. E., & Krosnick, J. A. (2014). Choosing the Number of Categories in Agree-Disagree Scales. Sociological Methods & Research, 43(1), 73–97.

Vaske, J.J. (2008). Survey research and analysis: Applications in parks, recreation and human dimensions. State College, PA: Venture Publishing.