

Economic Value and Impact of Visitation to Cape Hatteras National Seashore: Addressing On-Site Sampling



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Abstract:

We examine recreation demand, travel costs, and visitor expenditure patterns for Cape Hatteras National Seashore (CHNS) on the Outer Banks, North Carolina. CHNS is one of the largest protected barrier islands on the East Coast, comprised of nearly 30,000 acres along 140 miles of shoreline. The island system is unique, consisting of primarily thin barrier islands, dunes, and mud flats, backed by a large and shallow back-barrier estuary; CHNS is remote, accessible only by ferry or a single stretch of road running along the chain of islands. Data were collected at various beaches along CHNS in 2001-2002. We estimate count data demand models, controlling for endogenous stratification stemming from the on-site sampling. We present corrected estimates of economic value and extend the analysis of avidity bias to examine the impact of on-site sampling on economic expenditure analysis. The estimated net benefit of a day at CHNS is estimated at \$75.89/household and \$17.21/individual (2002 USD).

Purpose:

The purpose of this study is to examine economic value and economic impacts of visitors to Cape Hatteras National Seashore (CHNS). Utilizing onsite survey data, the single-site travel cost method (TCM) is used to estimate consumer surplus associated with access to CHNS. Correcting for avidity bias stemming from on-site sampling, we present a corrected recreation demand model as well as household expenditure estimates, which are used to assess the economic impacts of beach tourism. Our hypothesis is that expenditure estimates will be downward biased (reflecting lower spending patterns of more avid users that live closer to CHNS), which would give rise to underestimates of economic impact.

Data:

- On-site systematic intercept survey:**
- May 2001 to May 2002
 - 22 interview sites
 - Variables of interest include anything that could possibly influence visitor expenditure patterns
 - Other variables created include: Travel cost, dummy variables for varying levels of income, education, and seniority (64+)
 - $N = 1438$



Above the 22 interview sites distributed throughout the entire seashore. Each site was specifically selected to encompass a wide variety of resource types and available recreation activities

| | |
|-----------------------------------|-------------------|
| Average Age | 46.32 (S.D.=11) |
| Median Travel Distance | 330 miles |
| Average number of visits per year | 3.05 (S.D.=5.02) |
| Average group size | 4.04 (S.D.=16.21) |

- Follow-up mail back survey:**
- Expenditure statistics for 7 specific sectors
 - $N = 475$



Source: Daniel Polzin Photographs, 2011

CHNS is remote; only accessible via the Herbert C. Bonner Bridge (which spans Oregon Inlet) to the north and a ferry from Curacoa Island to the south. North Carolina's Highway 12 is the main thoroughfare along the island chain. While the bridge is necessary in providing residents and tourists accessibility between the islands and the mainland, the infrastructure is increasingly becoming weaker with each storm and bank inlet currents. A heated debate continues to rage regarding management of transportation infrastructure in the area.

The wide variety of recreation opportunities – such as fishing, boating, surfing, and sunbathing – support significant tourism activity at CHNS. Widespread recreational use of ORVs at Cape Hatteras National Seashore has proven to be controversial and problematic for management. Preserving environmental values and services while also providing sufficient public access is an ongoing dispute the National Park Service has had to face – particularly when managing ORV use.

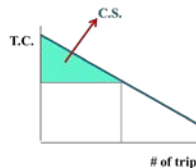


Source: Daniel Polzin Photographs, 2011

Methods:

The single-site TCM incorporates three main considerations: (1) the cost and distance traveled to the site, (2) time-value costs accounting for the opportunity cost of travel time, and (3) costs of substitute sites. Within the context of single-site demand equations, Shaw (1988) offers a correction for avidity bias using the Poisson model, and Englin and Shonkwiler (1995) extend the correction to the negative binomial model. We build upon these models to examine the effects of avidity bias in analysis of recreation demand, economic benefits of recreation, expenditure patterns, and economic impacts.

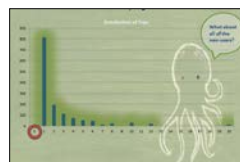
Estimating Welfare Measurements:



$$CS_{CHNS} = -\frac{\lambda_i}{\beta_{tc}}$$

Measuring the welfare obtained per annum to CHNS can be interpreted as consumer surplus (C.S.). Consumer surplus is simply the monetary value of having access to CHNS. Calculation of consumer surplus is the expected number of trips taken to CHNS by the individual (λ_i) over the coefficient on travel cost to CHNS (β_{tc}), or rather, the estimated slope of the demand curve.

A truncated sampling distribution resulting from on-site sampling:



Lacking information on non-users, we are not able to determine which people do not visit and why – implications for recreation demand analysis, satisfaction, displacement, etc.

Results:

Corrected and Uncorrected Poisson Estimates:

| Variable | Column 1: Uncorrected | | Column 2: Corrected | |
|----------|-----------------------|----------------|---------------------|----------------|
| | Coefficient | Standard Error | Coefficient | Standard Error |
| tcchns | -0.0023463*** | 0.000171 | -0.0038902*** | 0.0001611 |
| tcmyrtle | -0.0004557*** | 0.0001769 | -0.0010685*** | 0.0001736 |
| orv_user | 0.172622*** | 0.0557212 | 0.2827722*** | 0.0508643 |
| senior | -0.2320793 | 0.0882893 | -0.1004288** | 0.0420881 |
| college | -0.1911705*** | 0.0436921 | -0.2560091*** | 0.048022 |

Dependent Variable: Annual Trips to CHNS
 Statistical Significance: *** p < 0.01; ** p < 0.05; * p < 0.10
 Log Likelihood: -4237.035
 N=1438

Dependent Variable: Annual Trips to CHNS - 1
 Statistical Significance: *** p < 0.01; ** p < 0.05; * p < 0.10
 Log Likelihood: -4419.5768
 N=1438

Consumer Surplus Estimates (2002 \$USD):

| | Column 1: Uncorrected | Column 2: Corrected |
|--------------|-----------------------|---------------------|
| Annual C.S.* | 1349.41 | 783.68 |

* This figure is for the entire household

Expenditure Results:

| Types of Expenditures | Column 1: Uncorrected | Column 2: Corrected |
|------------------------------|-----------------------|---------------------|
| | Average Per Trip | Average Per Trip |
| Admission Fees | 10.61 (44.70) | 12.20 (1.33) |
| Food and Beverages | 434.93 (659.61) | 476.92 (51.03) |
| Shopping | 211.67 (317.42) | 232.68 (28.90) |
| Lodging | 408.50 (1082.03) | 618.50 (66.10) |
| Transportation | 87.42 (206.63) | 101.17 (10.82) |
| Entertainment and Recreation | 99.37 (287.60) | 113.90 (12.10) |
| All Other Expenses | 139.83 (822.05) | 165.57 (17.72) |
| Total | 1472.41 (3949.43) | 1711.02 (333.90) |

(N = 475)

Local Economic Impacts of Visitor Expenditures:

| | Uncorrected | Corrected |
|--|-------------|------------|
| Direct: household's total trip expenditures made at the seashore (within an hour's drive of Cape Lookout) | \$1,472.41 | \$1,711.02 |
| Indirect: resulting from businesses making purchases from other businesses as a result of initial spending | \$224.00 | \$281.00 |
| Induced: increases in household spending resulting from increases in compensation | \$219.00 | \$278.00 |
| Total: Direct + Indirect + Induced | \$1,915.00 | \$2,269.00 |

* A 17% increase in total economic impacts!!

Discussion:

The model and information produced from this study bring more clarity to the economic value of Cape Hatteras National Seashore. Results could have implications on policy by providing coastal managers with an unbiased platform for evaluating both monetary and non-monetary costs associated with preservation and/or restricted use of this site. Future applications could correct other variables associated with on-site data, such as satisfaction values obtained in a liker-it scale fashion.



Source: Daniel Polzin Photographs, 2011

References:

- Englin, J. and Shonkwiler, J. S. (1995). "Modeling recreation demand in the presence of unobservable travel costs: Toward a travel price model". *Journal of Environmental Economics and Management* 29(3), (1995): 368-377.
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