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Using value transfers and function transfers to estimate welfare loss from Lake Erie beach closures at multiple scales

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MICHIGAN STATE UNIVERSITY
KBS LTER Kellogg Biological Station Long-term Ecological Research
Great Lakes Protection Fund

Introduction

- Fueled by agricultural phosphorus runoff, harmful algal blooms (HABs) contaminate drinking water supplies, damage fisheries, and reduce recreational values.
- Recent large-scale HABs in Lake Erie have spurred demand for timely information about associated welfare loss and potential benefits of mitigating future blooms.
- Benefit transfer methods are widely recognized as an approach to estimate resource values when time and funding constraints inhibit primary data collection (Boyle et al., 2010).
- Value transfer is a straightforward benefit transfer method.
- Function transfer can account for heterogeneity among sites, but is more complicated and requires additional data.

Objectives:

1) To estimate and compare welfare losses from beach closures in Lake Erie using two common transfer methods – value transfer and function transfer.

2) To identify conditions under which the more time-consuming and data-intensive function transfer is worth the effort compared to a simple value transfer

Data for the Policy Site

Variable	Description	Source(s)
Benefit function	Coefficients for travel cost model (function transfer)	Chen, 2013
Population characteristics	Demographic data for residents of 4735 census tracts in OH, and parts of IN and MI.	American Community Survey, 2014.
Beach Length	Length of beach in miles	OH Department of Health, 2014 MI Dept. of Environ. Quality, 2014, Google Earth, 2014
Water Temperature	Average monthly temperature of surface water at points closest to each beach	NOAA, 2012 and 2014
Closure days	Number of days that beach specific advisories were issued in 2010	OH Department of Health, 2014 MI Dept. of Environmental Quality, 2014

Benefit Transfer

Step 1: Predict single day trips to each site

- We use the repeated nested logit model estimated by Chen (2013) to predict demand for single day trips to 67 Lake Erie beaches.

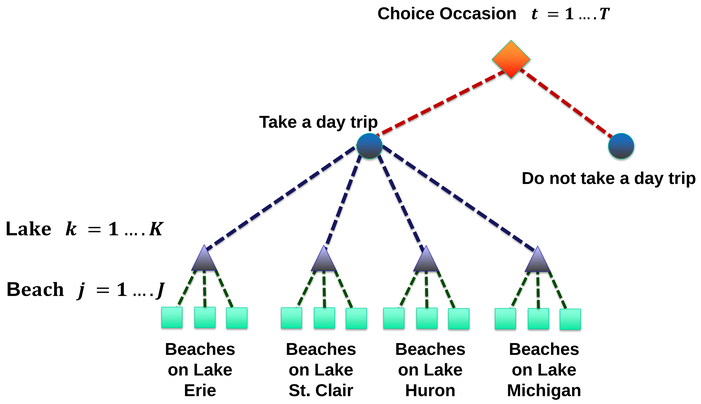


Figure 1. Repeated nested logit model

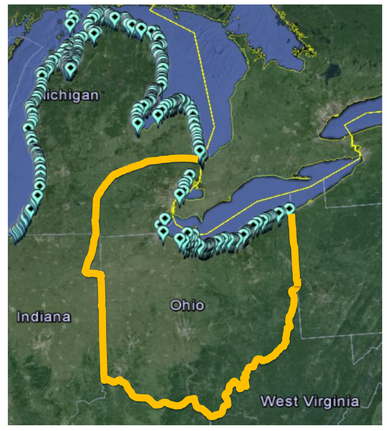


Figure 2. Population of potential Lake Erie Beach visitors for single day trips

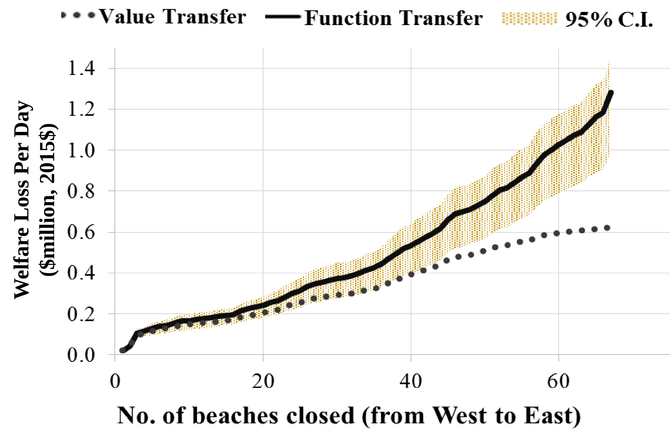
Step 2: Calculate welfare loss from beach closures using value transfer and function transfer

- We estimate the willingness to pay (WTP) to avoid beach closures for 33 beaches in the western basin and 34 additional beaches in the central basin.

Beaches Closed	Per-trip-to-site loss (2015$)			Aggregate Loss Per Day (2015$ thousand)		
	Value transfer (Chen)	Function transfer	% deviation	Value transfer	Function transfer	% deviation
1 Lake Erie Beach (average)	9.67	8.51	-12	9.29	8.26	-11
2 Michigan Beaches	9.67	10.15	5	76.60	80.44	5
6 Western Basin beaches	9.67	10.74	11	124.68	138.53	11
33 Western Basin beaches	9.67	12.54	30	307.24	398.33	30
67 Lake Erie Beaches	9.67	19.94	106	622.18	1282.98	106

Loss from Regional Beach Closures

Deviations between welfare estimates from the value and function transfer increase as more beaches close.



Conclusions

- In this study, a benefit function transfer was essential to estimate trip demand (number of trips) and demand elasticity (change in trips) when beaches close.
- Conditional on having trip estimates, the function and value transfers yielded similar results for individual beach closures.
- As previous research has shown, the scale of beach closures greatly affects per trip welfare losses (Parsons et al., 2009).
- Results from the two methods deviated (up to 106%) as more beaches closed because the value transfer did not account for the loss of beach substitutes as more of the choice set was affected.
- Original valuation studies can facilitate future benefit transfers by reporting welfare impacts at multiple scales.

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