Economic and societal impact of recreational activities: Guntersville Lake in Alabama

Benjamin B. Boozer, Jr.
Jacksonville State University

Jennifer Green
Jacksonville State University

Camaron Harry
Jacksonville State University

ABSTRACT

This research examines the relationship between economic impact and a larger societal impact through recreational lake activity on Guntersville Lake in Alabama. Economic variables are measured in producing economic impact within two counties where the lake is located and the larger region of contiguous counties. A metric for societal impact is derived from UN Human Development Index and recreational spending for 2013, 2018, and 2023 for these two geographic areas and state of Alabama. The model adds to the literature by examining 1) if a relationship exists between economic impact and societal impact, and 2) that a model for measurement can be developed for county-level observations. Results indicate that a positive association exists between economic and societal impact, but the results are less conclusive when adjusted for risk. The model has myriad application in local and regional observations and is especially useful in sensitivity analyses between spending patterns and output.

Keywords: Economic Impact, Guntersville Lake, Societal Impact, Economic Effects, Recreation

INTRODUCTION

Recreational activity is a burgeoning industry across the globe, with an increasing level of pursuit within a diversified stratum of society. Activity encompasses myriad events and locations as enthusiasts explore existing areas of interest, but also develop adventures from those interests that are complimentary and support quality of life (Campbell, Jarrett, Wali, Rosenthal, Alvira, Lemos, Longoni, Winter, & Lopez, 2023; Trice & Wood, 1958).

Economic activity associated with water recreation and global leisure is enormous (Schafft, Wegner, Meyer, Wolter, & Arlinghaus, 2021) Policy makers within the southeast U.S. region have targeted economic development and extrapolated survey data of freshwater natural resources to develop a consumer surplus model for valuation. This research addresses the burgeoning area that blends many aspects of economic impact and related research to a wider societal impact (Zhang, Yang, Kattel, Lin, & Shen, 2018)

In Alabama, while a plethora of freshwater lakes and tributaries exist, Guntersville Lake is the largest freshwater lake in the state (Outdoor Alabama, 2023) and is the focus of this analysis. McKee (2013) finds that the lake draws in a substantial number of tourists and generates significant revenue for the area. The study reveals that recreational anglers spend a considerable amount of money on various goods and services, such as lodging, food, and transportation, which has a substantial positive impact on the local economy.

Snelling (2015) analyzed the economic value of the tournament black bass fishery at Guntersville Lake. As a focal point for myriad economic activity in north Alabama, the total economic impact of the tournament fishery was estimated to be $6.7 million. Consumer surplus per visit for tournament black bass anglers was $667, and the overall willingness-to-pay was $1,122 per visit, with consumer surplus accounting for 59% of the total willingness-to-pay. Moreover, tournament anglers spent an average of $1,122 per visit, with most of their spending going towards lodging, food, and fuel.

A measurement of economic activity is paramount to identifying and understanding how such activity is beneficial to a populace at both a micro and macro level. A narrow focus considers a micro level of analysis, such as individual propensities for recreational activity and the effects of spending on the activity. A broader scope of activity captures a wider array of effects from the activity and is considered on a macro level, such as societal impact from the activity.

A common metric for considering measurement of economic activity is an economic impact analysis that considers economic activity inputs in producing impacts or outputs. A large component of this impact surrounds direct, indirect, and induced activity from spending propensities. Ojumu, Hite, and Fields (2016) analyze recreational fishing in the Black Belt region of southern Alabama and consider the types of impact produced and estimates possible increases in these impacts for a hypothetically improved fishing site. The goal is to develop ideal recreational characteristics for angler activities in that region to encourage improvement of water resources for recreational fishing purposes.

Societal impact is measurable by United Nations Social Development Goals (SDGs) and is arguably a better measure than economic impact in terms of total effects in benefitting a larger number of people with enhanced quality of life (Fecher & Hebing, 2021). Serafeim (2020) considers how these efforts extend to corporate leadership in syncing general social research policies with environmental, social, and governance (ESG) efforts that often do not consider an economic base.

This paper extends this approach, builds on the observations of McKee (2013) and Snelling (2015), and considers economic activity in addition to economic impact as a result of recreational activity in producing larger effects on society within the geographical area. The intent of the analysis is to expand on the limitations of economic impact to capture larger interconnected economic effects that espouse societal impact. The model seeks to develop the following: 1) that a relationship exists between economic impact and societal impact, and 2) that a model for measurement can be developed for county-level observations.

The analysis of Guntersville Lake is a case study locus for regional recreational activity. From survey data that measure lake usage and recreational preferences, the analysis inspects spending, identifies types of economic contributions, and calculates economic impacts and economic effects from the county where levels of activity originate. Using county level variables, a human development index model is developed that borrows from a United Nations model for societal impact by country. The analysis contends that economic impact and societal impact correlate, and that economic activity creates not only an immediate impact but pushes to larger effects that encompass a society. To follow is a review of relevant literature, a methodology section, analysis of data, societal impact results, conclusions, and references.

LITERATURE REVIEW

An expansive body of literature exist that addresses recreational activity and human development but is insufficient in developing a risk and return relationship based on the relationship between economic variables and human development. Osterhaven and Van Der Knijff (1987) added to the literature of a relationship between the degrees that consumers react to recreation and tourism and the relevant output. Their research shows that significant differences exist from how recreational expenditures are financed, either by allocating from another recreational expenditure budget or from normal expenditures that are not necessarily earmarked to recreation. The research addresses the inherent challenges in measuring the economic contributions of recreation and tourism. These sectors are notorious for their multifaceted nature, making traditional economic analysis techniques insufficient. Their research presents an input-output analysis as a robust alternative and enables a comprehensive examination of the ripple effects that tourism and recreation expenditures have on various sectors within an economy. By tracking the interdependencies among industries, the researchers aim to reveal the full scope of economic linkages that result from the influx of tourist spending. Through this analysis, Oosterhaven and van der Knijff successfully uncover the direct and indirect effects of tourism and recreation expenditures on employment, income, and value-added in the local economy.

Cicchetti, Fisher, and Smith (1973), provide an exploration of the economic dimensions inherent in planning outdoor recreation activities. This study offers valuable insights into the application of economic models to the decision-making process surrounding outdoor recreation management and policy development and addresses the crucial challenge of balancing environmental conservation and public enjoyment of outdoor recreational activities. Making informed decisions requires a rigorous understanding of the economic consequences involved. They argue that economic models offer a systematic framework to analyze the intricate relationships between various stakeholders, natural resources, and recreational opportunities. Their approach introduces and evaluate various theoretical approaches, including cost-benefit analysis, demand analysis, and user-fee models. By presenting these models and their

applications in a unified context, the authors provide readers with a holistic perspective on how economic principles can guide decision-making in the realm of outdoor recreation.

Trice and Wood (1958) provide evidence that the need to measure cause and effect of recreation should be quantified in developing models for capacity and land use initiatives. Trice and Wood address the inherent complexities of measuring the benefits of recreation, an area often overlooked in traditional economic analyses. They acknowledge that the value of recreational activities extends beyond direct financial transactions, encompassing individual well-being, community cohesion, and broader societal impacts. The authors present a comprehensive framework for understanding and quantifying these multifaceted benefits, thus filling a significant gap in the understanding of recreational economics and introduce and assess diverse approaches, ranging from direct market valuation to the innovative concept of "travel cost" models. The research emphasizes the importance of considering both use and non-use values associated with recreational sites, offering insights into how individuals perceive and derive satisfaction from such experiences. By categorizing these approaches and highlighting their respective strengths and limitations, the authors provide an invaluable resource for researchers and policymakers alike.

Granovetter's (2005) central premise is that social networks play a pivotal role in influencing economic outcomes. Individuals are embedded within complex webs of relationships, which serve as channels for information, opportunities, and resources. By tapping into this social fabric, Granovetter argues that people access information that might otherwise be inaccessible, thereby impacting their economic decisions and prospects. Through integration of diverse disciplines and combining insights from sociology and economics, Granvotter constructs a compelling argument that transcends disciplinary boundaries and skillfully navigates complex theoretical concepts, making them accessible to a broader audience while maintaining academic rigor. By explaining the interplay between social structure and economic outcomes, Granovetter enhances understanding of human behavior in economic contexts.

Engineer and King (2013) acknowledge the United Nations Human Development Index (HDI) as a measure of social well-being but propose using consumption rather than income as a proxy for a decent standard of living. They argue that the UN HDI, which takes into account income, education, and life expectancy, offers a more encompassing lens to evaluate societal progress. This approach reflects the philosophy that human development should be considered a multi-dimensional phenomenon, encapsulating both material and non-material aspects of well-being. The authors dissect the three dimensions of the HDI (health, education, and income) and delve into the underlying rationale and methodology for combining them into a single composite index. By dissecting the complexities of the HDI, the research provides a comprehensive overview of its strengths and limitations, making it an invaluable resource for researchers, policymakers, and practitioners interested in both the theoretical foundations and practical applications of the index.

Misselhorn (2008) questions inequality within respective measures of HDI as a factor that affects accuracy of measurement. This research proposes using quintiles of income to reduce the effect on human development and delves into the complex interplay between human development, income disparities, and social well-being. Through an exploration of the Human Development Index (HDI) and its breakdown by income groups, Misselhorn offers a thought-provoking analysis that illuminates the multifaceted dimensions of poverty, undernutrition, and child mortality. By dividing the population into various income categories, disparities in income

distribution can significantly impact human development outcomes, with emphasis on the relationship between income, well-being, and social progress.

Cahill (2005) posits that the HDI has significant correlation with GDP, suggesting that the measure is redundant, but finds that the measure is otherwise objective and can be modified by weighting each of the three input variables. The HDI has long been considered a vital metric for assessing a country's development and well-being, incorporating factors such as life expectancy, education, and per capita income. Cahill's study challenges the established notion of the HDI's effectiveness and seeks to determine whether it truly captures the diverse nature of human development. The research acknowledges the HDI's widespread acceptance as a measure of development due to its simplicity and comprehensiveness, as it combines economic, health, and educational indicators into a single numerical value. Despite this, Cahill raises the crucial question: Does the HDI truly capture the intricacies of human development, or has it become redundant in an era where alternative indices and methodologies exist? Cahill delves into a thorough analysis of the HDI's limitations, which include its neglect of key dimensions such as environmental sustainability, inequality, and cultural factors. Cahill asserts that these omissions hinder the HDI's ability to provide a holistic picture of development and well-being. Citing examples of countries with similar HDI scores but differing levels of inequality and environmental impact, the research highlights the index's shortcomings in capturing crucial disparities.

In this research, Cahill also introduces the Inequality-adjusted Human Development Index (IHDI) as an attempt to address the HDI's limitations. This modified index factors in inequality within each dimension, thus offering a more nuanced assessment of development. Cahill presents empirical data comparing HDI and IHDI rankings, revealing significant differences in the evaluation of certain countries' development achievements. This comparison underscores the necessity of considering inequality when assessing human development. By incorporating inequality and environmental sustainability, Cahill enriches the discourse surrounding human development assessment.

METHODOLOGY

The methodology employed in this research considers the measurement of economic activity surrounding Guntersville Lake and surrounding counties in northern Alabama. That activity is expressed as economic effects and economic impact. In expanding the scope of these outputs, a societal benefit component is included that establishes a metric for relative comparison.

The model identifies a span of economic variables with an association to the lake and related region that captures aspects of economic activity. Economic impact is derived from fishing and visitors to Guntersville Lake and individuals who reside there as a result of its existence. Economic effect consists of fiscal effects, property valuation, county level recreation household spending, boat sales, employment, and dam operations.

Regional economists too often apply inconsistent terminology in developing and analyzing a model. This analysis borrows from Watson et al. (2007) in advancing distinct definitions that are used throughout this report in explaining the economic relationship between Guntersville Lake and the local economy. These terms and accompanying definitions are listed as follows:

- Economic Activity – Dollars spent within region that are attributable to a given industry, event, or policy
- Economic Contribution or Effect – Gross change in economic activity associated with an industry, event, or policy in an existing regional economy
- Economic Impact - Net changes in new economic activity associated with an industry, event, or policy in an existing regional economy
- Societal Impact - Net increase in total social welfare. Economic benefits include both market and nonmarket values

While economic activity provides a comprehensive perspective, an integral part of this analysis surrounds economic effect and impact, which is positively related to economic benefits flowing to sectors of society overall. Economic contribution or effect may be the results of spending explicitly related to Guntersville Lake (Counties of Marshall and Jackson), and more fully expands to capture interconnectedness of regional area (Counties of Blount, Cullman, DeKalb, Madison, and Morgan) economic links that point back to the lake and related region. Contribution denotes that the study addresses how the current state of an industry supports other businesses in a local economy in contributing to or sustaining economic activity as a result of the lake and lake activity.

Economic impact, while no less important, is more narrowly defined and reserved to describe to the extent that either new revenues where generated or existing revenues were retained from the existence of an industry, event, or policy. From this analysis of Guntersville Lake, a relatively smaller economic impact is anticipated relative to economic effect since changes in revenues from activity there are not expected to be large, but the contribution or effect to the economy from the lake and related region demonstrates significant interconnectedness as discussed. The following areas of economic impact and effects are measurable: Fiscal effects from taxation; property values; county level recreation household spending; boat sales; employment by sector; and dam operations.

Economic Impact Model

This analysis of Marshall and Jackson counties and the surrounding river region (Blount, Cullman, DeKalb, Madison, and Morgan counties) in measuring the economic impact of Guntersville Lake utilized IMPLAN statistical software. IMPLAN is a general input-output model for identifying appropriate variables for analysis and measuring the economic impact associated with those variables. IMPLAN is an acronym for Impact Analysis for Planning and is widely used in all areas of academia and industry in conducting such analysis.

The model for analysis was developed to measure changes in output associated with various levels of input. A significant component of the model considers not only how the immediate input directly impacts output levels, but also how many effects do not occur immediately but manifest over time as the initial economic activity multiplies throughout the economy. It is important to note that IMPLAN does not capture energy related areas in its calculations. Thus, those effects must be tallied and measured separately in this analysis.

Multiplier Analysis

An economic multiplier constitutes a measure of spending and consumption propensities that is employed to capture outputs derived from inputs employed. By using a multiplier economic activity is measured not as a static phenomenon, but rather based on additional economic activity that begets even further economic activity. IMPLAN offers the ability to estimate economic relationships between and among industries through linkages across all sectors. This capability is invaluable in analyzing how one sector affects a plethora of other sectors that may be otherwise dissimilar. Within each industry and region IMPLAN generates three multipliers based in these spending and consumption propensities: employment; labor income; and output.

Economic Effects: Direct, Indirect, and Induced

Aggregate demand and economic activity are generated through an immediate impact and one or more subsequent impacts. An economic impact model utilizes at what point these effects occur in quantifying economic activity. Using multiplier analysis, the results of this study are conveyed through three effects: direct; indirect; and induced.

- Direct Effect: Initial effect, which represents the initial change in the industry measured after application of input variable(s) to the model.
- Indirect Effect: Measures changes in inter-industry transactions where supplying industries respond to increased demand from directly affected industries.
- Induced Effect: Measures changes in local household spending as a result of changes in income in directly and indirectly affected industries.

Measuring Societal Impact

Societal impact is measured separately from economic impact and effects. For this model the bigger issue is social effects in addition to economic effects. Societal impact is defined as the extent to which an organization or event creates a positive change in addressing a challenging social problem (Stephan, Patterson, Kelly, and Mair, 2016). In identifying societal impact the analysis uses guidance in part from Kabadayi and Jason-DeBartolo (2021) and select United Nations Sustainable Development Goal (UN SDG) three (Good Health and Well-Being), four (Quality Education), and eight (Decent Work and Economic Growth) as emphasis in developing the following measure for this model (UN, 2023).

The model contends that recreational lake activities produce a positive societal impact through not only the gross changes in economic activity from economic effect, or the net changes calculated by economic impact, but also the benefit to society from such economic activity through a net increase in total social welfare that is derived from the following Societal Impact Index (SII).

Modified from the United Nations Human Development Index (UN HDI, 2023), which considers human development at the country level by measuring length of life, knowledge, and standard of living in comprising dimensions of the index, the SII model is more narrowly focused on county level activities. As reasonable proxies for the three UN HDI dimensions, a life potential metric is a proxy for years of potential life lost or premature death and used for length of life, high school graduation or completion for knowledge, and per capita real GDP in relation to appropriate GINI coefficient for standard of living. SII coefficient is calculated as follows, with higher values for each of the three metrics making positive contribution:

SII = Geomean (life potential metric X high school completion X real per capita GDP), where
- life potential metric = 100,000 - years of potential life lost before age 75 per 100,000 population / 100,000
- high school completion = percentage of adults aged 25 and older with a high school diploma
- per capita real GDP = (real GDP by county) / (population of county X Gini Coefficient)

An SII is developed for three periods (2013, 2018, and 2023) in the prior decade for Guntersville Lake Counties, Region Analysis Counties, and state of Alabama. Trends are analyzed for each period in relation to these geographies in observing nominal changes in the SII and changes within the units of its measure. Human development trends for 2013, 2018, and 2023 are expressed as a function of SII index development. Recreational spending categories – recreational vehicles and fees, and sports, recreation, and exercise equipment – are examined within each of the three geographic designations and expressed via statistical measures of variance and volatility. For the category recreational vehicle and fees the sub-categories are docking and landing fees for boats and planes; camp fees; payments on boats, trailers, campers, and RVs; and rental of boats, trailers, campers, and RVs. Sports, recreation, and exercise equipment category is divided into these sub-categories: exercise equipment and gear, games tables; bicycles; camping equipment; hunting and fishing equipment; winter sports equipment; water sports equipment; other sports equipment; and rental or repair of sports, recreation, and exercise equipment. These spending categories represent the primary derivation for economic impact and will be analyzed in measuring to what extent that spending that produces economic benefits translates into societal impact.

ANALYSIS OF DATA

Output of the research is grouped according to economic impact and societal impact. Table 1 Guntersville Lake Total Economic Activity by Economic Variable (Appendix) depicts the economic activity associated with Guntersville Lake for the immediate counties and the contiguous counties of the region. While economic impact considers any economic variable directly tied to the existence of the lake – Fishing and Visitors and Residents' Contributions – that would not have occurred if the lake did not exist, larger economic activity includes various economic effect from economic activity generated as a result of the lake.

Total economic activity from the immediate area of Guntersville Lake – Jackson and Marshall County – is $1,202,298,945 and $1,435,420,463, respectively, when encompassing the region analysis counties – Blount, Cullman, DeKalb, Jackson, Madison, Marshall, and Morgan counties. Economic impact is derived from a summation of fishing and visitor activity and residents' contribution. Total economic impact is calculated as $23,866,429, which is delineated as $17,456,923 for fishing and visitors and $6,409,506 for residents' contributions. These two categories represent fishing, tournaments, and related activities that occur on the lake, while residents' contributions are the day-to-day activity of living and working that are associated with the existence of the lake.

Societal impact finds its origins in human development that not only produces a longer and better life, but also a higher standard of living from economic development. Using the measures for SII – life potential metric expressed as years of potential life lost or premature

death, high school graduation, and GDP – values were calculated for each for 2013, 2018, and 2023 within the three geographies and expressed as percent change for those periods. Guntersville Lake region of Blount, Cullman, DeKalb, Madison, and Morgan Counties produced the largest percent increase of the three geographies, while the state and the immediate area of Jackson and Marshall County experienced smaller increases, respectively.

Table 2 Human Development Trends – 2013, 2018, and 2023 (Appendix) presents the data for illustration. Within overall trends individual trends appear, with high school graduation increasing disproportionately for each geography and GDP gains for the region area surrounding Guntersville Lake primary drivers in these calculations.

Economic impact is derived from spending and the net effects produced as exchange of dollars reverberates through an economy. While spending levels within populations are largely determined by spending propensities, categorically identifying spending levels provides a basis for economic activity that produces societal impact. In Table 3 Categorical Spending by Geography – 2023 (Appendix) the spending categories are examined that were identified in analyzing economic impact and its effects. Each category is examined by geography for 2023 and statistically examined. While spending averages were similar, individuals within the region outside of the immediate area spent an average of $11.73 per capita for those categories, while spending averages for the state and immediate area were $11.23 and $10.91, respectively.

Considering the volatility of this data as a measure of risk, the standard deviation of spending values was higher for the region but is highest for the immediate area once expected values are included with coefficient of variation.

SOCIETAL IMPACT RESULTS

The results of the analysis indicate that human development trends are positive for each of the three SII categories, increasing for each index category and geography by period. This suggests that based on the SII metric that societal benefit has occurred within the period analyzed. Increases in life potential metric indicate a reduction in premature deaths, while an expansion in high school graduation cohorts portends a higher standard of living and employment potential. The productive aspects of these data are consistent with those two variables, as GDP grew solidly during the period.

From human development trends in Table 2 (Appendix) the region surrounding the immediate area of Guntersville Lake experienced the largest increase in nominal societal impact, and the immediate area of Jackson and Marshall Counties the least. Spending patterns in Table 3 (Appendix) corroborate these findings as average spending on recreational categories per capita is less in the immediate Guntersville Lake area counties and also with higher volatility or risk.

Further examination of the results in Table 4 Human Development Index Examined – 2023 (Appendix) considers the relationship between a HDI as a measure of societal impact and economic categories variables for spending and risk. While the region area of Blount, Cullman, DeKalb, Madison, and Morgan Counties has the highest HDI and the highest categorical, per capita spending average, the HDI per spending dollar is smallest in the region and greatest in the immediate area of the lake – Jackson and Marshall Counties. This suggests that 1) a link between economic impact and societal impact exists, and 2) that each spending dollar produces a greater overall benefit as a result of recreational activity. These findings are less robust, however, when risk is introduced. The metric for HDI per unit of risk is, in fact, lowest for the immediate area, suggesting volatility of spending patterns indicates uncertainty and may or may

not produce societal impact benefits that would otherwise occur from spending dollars circulated.

CONCLUSION

The results of this analysis indicate that a relationship exists between economic measures of activity and benefits to society at large. The model, however, is not robust when risk or volatility of spending is applied and suggests that the relationship between economic impact and societal impact could vary depending on myriad factors that affect spending propensities and overall levels of commerce. This finding is consistent with Osterhaven and Van Der Knijff (1987) in measuring the relationship between consumers' reaction to recreation and the relevant output from spending. To the extent that recreational activity may differ from other industries parallels interactions through various social networks of individuals (Granovetter, 2005).

This model addresses the weaknesses of UN HDI that Cahill (2005) and Misselhorn (2008) identified by focusing on a smaller region with a more homogeneous base of individuals rather the broad scope of a nation with much greater heterogeneity. The model also provides an adequate proposition to Engineer and King's (2013) research in dissecting these complexities on a smaller level.

Lastly, by capturing three UN SDGs in SII development the emphasis is directed toward established criteria to benefit society. In calculating benefit within a context of risk, this research further extends prior measures beyond nominal comparisons. This research may be applied at local and regional levels of analysis with various controls to isolate risk. Sensitivity analysis between spending and outputs is a way to identify a risk profile within a context of how individuals perceive and derive levels of satisfaction (Trice and Wood, 1958) and how those decisions impacting relationships between economic impact benefit and societal impact consequences.

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APPENDIX

Table 1 Guntersville Lake Total Economic Activity by Economic Variable

Economic Variable	Economic Activity by Area Analyzed	
	Guntersville Lake Counties*	Region Analysis Counties**
Fiscal Impact Base Case	$90,168,513	$248,122,740
Lakefront Property Value	$421,689,121	$421,689,121
Fishing and Visitors	$17,456,923	$17,456,923
Residents' Contributions	$6,409,506	$6,409,506
Recreational HH Spending	$9,707,342	$62,175,637
Boat Sales	$18,153,724	$40,852,720
Employment by Sector	$613,214,624	$613,214,624
Dam Operations	$25,499,192	$25,499,192
Total Economic Activity	$1,202,298,945	$1,435,420,463

*Guntersville Lake Counties in Alabama: Jackson and Marshall
**Region Counties: Marshall, Jackson, Blount, Cullman, DeKalb, Madison, and Morgan Counties

Table 2 Human Development Trends – 2013, 2018, and 2023

Human Development Categories	Jackson and Marshall Counties			
	2013	2018	2023	% Change
Years of Potential Life Lost	10,625	11,000	10,950	1.52%
High School Graduation	81.00%	92.00%	91.50%	6.28%
Gross Domestic Product	$2,176,620	$2,333,783	$2,421,564	5.48%
				3.74%
	Blount, Cullman, DeKalb, Madison, Morgan Counties			
	2013	2018	2023	% Change
Years of Potential Life Lost	8,680	9,120	10,320	9.04%
High School Graduation	77.80%	91.40%	94.60%	10.27%
Gross Domestic Product	$5,870,260	$6,650,952	$7,321,161	11.68%
				10.27%
	Alabama			
	2013	2018	2023	% Change
Years of Potential Life Lost	9,609	9,600	10,400	4.03%
High School Graduation	72.00%	89.00%	91.00%	12.42%
Gross Domestic Product	$191,370	$200,373	$209,979	4.75%
				6.20%

Source: County Health Rankings (https://www.countyhealthrankings.org/); FRED Economic Data
Years of potential life is the inverse of premature death variable from which the life potential metric is derived. High School Graduation represents the percentage of ninth-grade cohort that graduates in four years.

Table 3 Categorical Spending by Geography – 2023

Categorical Spending	Marshall, Jackson Counties	Blount, Cullman, DeKalb, Madison, Morgan Counties	Alabama
Docking and Landing Fees for Boats and Planes	$5.12	$5.36	$5.13
Camp Fees	$7.27	$8.76	$9.00
Payments on Boats, Trailers, Campers, RVs	$30.50	$29.53	$25.65
Rental of Boats, Trailers, Campers, RVs	$8.61	$9.18	$8.52
Exercise Equipment and Gear, Game Tables	$20.91	$25.62	$26.71
Bicycles	$14.22	$16.20	$16.06
Camping Equipment	$5.04	$5.89	$5.91
Hunting and Fishing Equipment	$26.39	$27.28	$25.29
Winter Sports Equipment	$1.80	$2.19	$2.30
Water Sports Equipment	$4.34	$4.57	$4.33
Other Sports Equipment	$5.69	$5.12	$4.78
Rental or Repair of Sports, Recreation, Exercise Equipment	$1.01	$1.08	$1.03
Spending Average	$10.91	$11.73	$11.23
Standard Deviation	9.45%	9.84%	9.22%
Coefficient of Variation	0.87	0.84	0.82

Source: Environmental Systems Research Institute, Inc. (ESRI)

Table 4 Human Development Index Examined – 2023

Index	Marshall, Jackson Counties	Blount, Cullman, DeKalb, Madison, Morgan Counties	Alabama
Societal Impact Index (SII)	1.1721	1.1891	1.1804
Categorical Spending Average	$10.91	$11.73	$11.23
SII per spending dollar	0.1074	0.1014	0.1051
SII per unit of risk	1.3525	1.4183	1.4376

Human Development Index (HDI) is calculated for each of the three geographies analyzed in the 2023 model – Jackson and Marshall Counties; Blount, Cullman, DeKalb, Madison, and Morgan Counties; and Alabama.