

Evaluating the Ecological Association of Casino Industry Economic Development on Community Health Status: A Natural Experiment in the Mississippi Delta Region

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Objectives of this study were to examine for associations of casino industry economic development on improving community health status and funding for public health services in two counties in the Mississippi Delta Region of the United States. An ecological approach was used to evaluate whether two counties with casino gaming had improved health status and public health funding in comparison with two noncasino counties in the same region with similar social, racial, and ethnic backgrounds. Variables readily available from state health department records were used to develop a logic model for guiding analytical work. A linear regression model was built using a stepwise approach and hierarchical regression principles with many dependent variables and a set of fixed and nonfixed independent variables. County-level data for 23 variables over an 11-year period were used. Overall, this study found a lack of association between the presence of a casino and desirable health outcomes or funding for public health services. Changes in the environment were made to promote health by utilizing gaming revenues to build state-of-the-art community health and wellness centers and sports facilities. However, significant increases in funding for local public health services were not found in either of the counties with casinos. These findings are relevant for policy makers when debating economic development strategies. Analysis similar to this should be combined with other routine public health assessments after implementation of development strategies to increase knowledge of health outcome

trends and shifts in socioeconomic position that may be expected to accrue from economic development projects.

KEY WORDS: gaming economic development, gaming and health, public health finance

Over the past two decades, states and local municipalities have increasingly turned to commercial casino gaming (eg, private sector, nontribal) as a method of stabilizing government revenues.^{1,2} In 2004, 11 states received \$4.7 billion in casino gaming revenues earned through 455 commercial casinos.³ This strategy for economic development has been particularly attractive to impoverished communities in the Mississippi Delta Region (Delta Region) of the United States. In 1991, four Delta Region states (Illinois, Louisiana, Mississippi, and Missouri) began enacting laws for casino gaming. From

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a public health perspective, the introduction of casino gaming into these communities does have benefits for research by providing the opportunity to use natural experiments to examine for increases in community health status and funding patterns that may accrue from shifting socioeconomic positions. Interest in this is based on well-documented research findings that show correlations of poor socioeconomic status to negative health outcomes.⁴⁻⁶

● History of the Delta Region

Outlining the Delta Region are sections of eight states that stretch more than 90,000 miles from southern Illinois to New Orleans, with the Mississippi River at the heart of most of the region. Binding this socially isolated geographic area is a rich and proud history of many diverse cultures, despite legacies of poverty, racial and ethnic segregation, and economic inequality. The epicenter for inequality could have been Tunica, Mississippi, described in the 1990s as a *developing country* in the middle of America.⁷ Measures of socioeconomic disparity in the Delta Region are pervasive as reflected by poverty rates 55 percent higher than the national rate and per capita income levels below the national average in 99 percent of the jurisdictions.⁸

● Study Purpose

The purpose of this study was to evaluate the ecological association between the presence of the casino industry and improvements in community health status and funding for public health services in two areas of the Delta Region: Tunica County in the State of Mississippi and Pemiscot County in the State of Missouri. The study included a noncontiguous Delta Region comparison county from each state: Tallahatchie County, Mississippi, and Mississippi County, Missouri, where casino gaming had not been introduced. These noncontiguous counties without casinos have similar social, racial, and ethnic backgrounds to the two counties with casinos. The investigation focused on key health indicators that, reasonably, could have been influenced in the relatively short-time period examined in this study (1993 through 2004) and were readily available from public files. Other variables were selected, in part, on the basis of findings from prior gaming studies (ie, violent crime rate, emergency medical services run rate, motor vehicle death rate).⁹ Socioeconomic factors that have been identified as predictors of health such as income, education, and employment^{6,10,11} were examined as well.

● County Profiles

Tunica County, Mississippi

Tunica County is located approximately 40 miles south of Memphis, Tennessee. Gaming was legalized by Tunica County government in 1992, with the initial casino opening in October of that year.¹² Two additional casinos opened in November and December of 1993.¹² Tunica's distinction has rapidly transformed from that of the poorest county in America to its current status of the 5th largest resort casino market in the United States (based on 2004 total gaming revenues) with 9 of the state's 29 casinos.³ Tunica County's 2004 population of 10,066 was 24 percent higher than a decade earlier.¹³ Minorities represent more than 73 percent of that population.¹³

Tallahatchie County, Mississippi

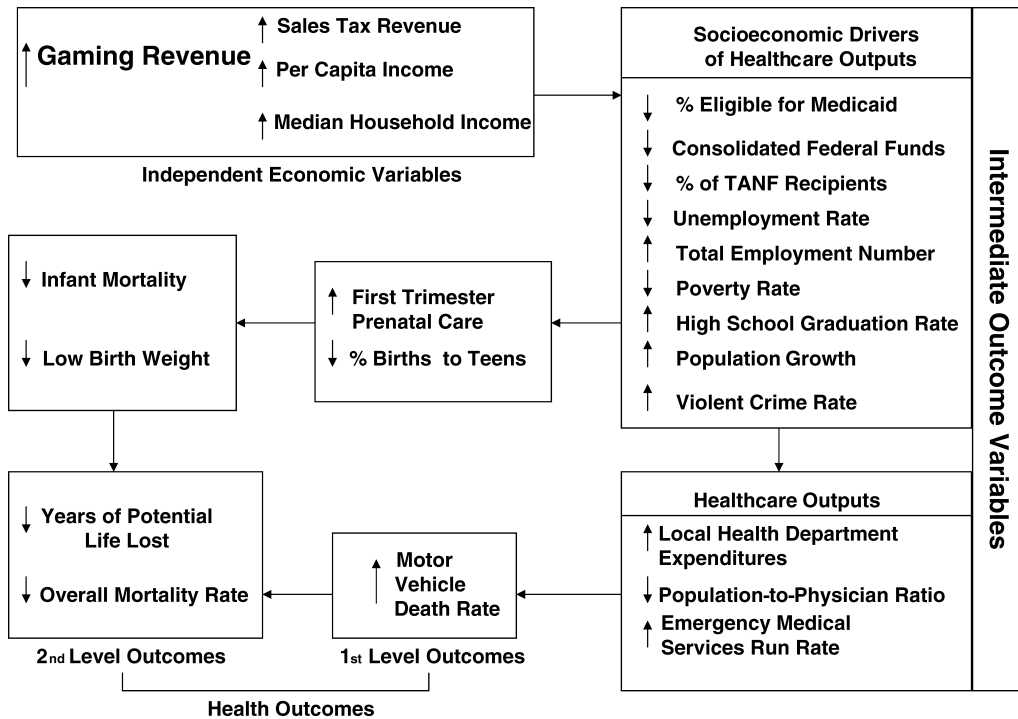
Tallahatchie County is located 90 miles southeast of Tunica County. Casino gaming has not been adopted by Tallahatchie County government. Total county population in 2004 was 14,255, down 3 percent from a decade ago.¹³ Minorities represent 61 percent of the population.¹³

Pemiscot County, Missouri

Pemiscot County is located in the southeastern corner of Missouri known as the *Bootheel*. The county sits about 90 miles north of Memphis, Tennessee. The 2004 population in the county was 19,571, down 7 percent from 1995 with 26.4 percent of the residents being minorities.¹⁴ In 1992, gaming was authorized in Missouri and in the local municipality of Caruthersville located in Pemiscot County.¹⁵ The population in Caruthersville was 6,450 in 2004 down 4 percent from that in 2000.¹⁶ The only casino in Pemiscot County, Casino Aztar, opened in the City of Caruthersville in 1995.¹⁵

Mississippi County, Missouri

Mississippi County, Missouri, is located northeast of Pemiscot County and is also part of the Missouri *Bootheel*. There is no casino gaming in Mississippi County. Total Population in 2004 was 13,697, down 1 percent from 1995, with 20 percent representing minority populations.¹⁴ The second largest employer in the county is a state prison (439 employees)¹⁷ and represents an increasing rural community economic development strategy that has not been supported with positive long-term economic impact findings in recent reports.^{18,19}



* Vertical arrows indicate expected trends over the study period.

FIGURE 1. Logic model.*

● Methods

Design and data

We used an ecological approach to evaluate whether communities having casinos attained better health status and public health funding than other communities without casinos. Understanding the limitation of this approach (ie, it can only suggest associations that will need further and more rigorous testing of hypothesis), we used variables readily available from state health department records and other sources to develop a logic model for guiding analytical work that addresses this evaluation (Figure 1). The logic model is limited in that it is not fully comprehensive (ie, not all potential steps and variables are included). As an illustration, the jurisdictions under review are very small and as such, relevant variables such as health insurance rates are not available at the county level for multiple time periods. However, this study does allow the investigators to show the feasibility of this approach using readily available data.

The more specific research questions addressed in this model were as follows:

1. Is casino revenue associated with economic development of a community?
2. Is economic development of a community with a casino associated with health expenditure, healthcare coverage, and health services delivery of a community?

3. Are the health expenditures, healthcare coverage, and health services delivery of communities with a casino associated with the health status of its population?

We used county-level data on 23 variables over an 11-year period (1993–2004) for Tunica and Tallahatchie counties. However, some data for Tunica and Tallahatchie counties were missing for either 1993 or 1994. When 1993 or 1994 data were missing, the year available was used as the baseline or a baseline value was calculated as the average of the 1993 and 1994 data. Data for a 10-year period (1995–2004) were used for Pemiscot and Mississippi counties in the State of Missouri. Casino gaming was not introduced in the same period for the counties and explains the use of two different baseline years.

Analysis and measures

The variables are presented in the “logic model” as “independent economic variables,” “socio-economic drivers of healthcare outputs,” “healthcare outputs,” and “health outcomes” (Figure 1). The independent economic variables were *gaming revenue, sales tax revenue, per capita income and median household income*; the socioeconomic drivers of healthcare outputs were *percentage eligible for Medicaid, Consolidated Federal Funds* (representing federal expenditures and obligations disbursed to a county), *unemployment rate, percentage of TANF recipients, and total employment number* (estimates

of the total number of full-time and part-time jobs), *poverty rate* (all ages), *high school graduation rate*, *population growth and violent crime rate*; the healthcare outputs were *local health department expenditures*, *population to physician ratio*, and *emergency medical services run rate*; and the health outcomes were *first-trimester prenatal care rate*, *percent births to teens*, *motor vehicle death rate*, *infant mortality rate* (5-year moving average), *low birth-weight rate*, *years of potential life lost rate* (YPLL), and *overall mortality rate*.

We used multivariate linear regression with a stepwise approach to develop hierarchical regression models with many levels of dependent variables and a set of fixed and nonfixed independent variables extracted from the logic model (Figure 1). The variables in the “independent economic variables” set, a dichotomous variable denoting membership to a county with or without a casino (coded 1 if casino present and 0 otherwise), a dichotomous variable denoting state origin of data (coded 1 if Missouri and 0 if Mississippi) and an ordinal time variable (coded from 1 to 11) entered all models as “fixed” independent variables. As such, the “fixed” set remained as predictors in every model of the stepwise hierarchical approach. Except for the “fixed” independent variable set, all other variables entered models as both dependent and independent variables in a three-step regression modeling as follows: (1) In the first step, the “fixed” set entered models as independent variables and the “socioeconomic drivers of healthcare outputs” were dependent variables. If any of the “socioeconomic drivers of healthcare outputs” variables was identified as significantly associated with casino presence or gaming revenue, then this variable was added as an independent variable together with the “fixed set” of predictors in the second step analysis that had “healthcare outputs” as dependent variables; (2) in the second step, if any of the “healthcare outputs” variables was identified as significantly associated with casino presence or gaming revenue, then this variable was added as an independent variable together with the previous step’s predictors in the final level model (third step) that had “health outcomes” as dependent variables. In this way, the associations of presence of a casino and gaming revenue with “socioeconomic drivers of healthcare,” “healthcare outputs,” and “health outcomes” variables could be explored while adjusting for the effect of other variables in the logic model but without overadjusting for intervening variables that were in the pathway between casino-related variables and the outcomes of interest.

● Results

Results of trends over time analysis for all variables are shown in Table 1. Over the study period of 1993–

2004, the casino and noncasino counties all had statistically significant ($P < .05$) increases in per capita income, one of the fundamental economic variables in the study (Figure 1). Sales tax revenue significantly increased in two casino counties, Tunica and Pemiscot. Median household income increased significantly in the two casino counties, Tunica and Pemiscot, and in a noncasino county, Tallahatchie. The gaming revenue increases were statistically significant in both counties with casinos, Tunica and Pemiscot.

During the period under study, the intermediate health outcome, first-trimester prenatal care rate increased significantly in a noncasino county, Mississippi, and decreased significantly in a casino county, Pemiscot. The population-to-physician ratio increased significantly in a noncasino county, Tallahatchie, and decreased in another noncasino county, Mississippi. Local health department expenditures significantly decreased in one county with a casino, Tunica, and significantly increased in a county without a casino, Mississippi.

The teen birth rate, classified as a health outcomes in the logic model (Figure 1), had a statistically significant decrease in all four counties studied in 1993–2004. The infant mortality rate decreased significantly in the noncasino counties, Tallahatchie and Mississippi, while the overall mortality rate significantly decreased in Tunica.

The first, second, and final steps of the regression modeling approach are presented in Tables 2, 3, and 4, respectively. The presence of casino gaming in the community was “positively” associated with intermediate economic determinants of health from the logic model such as the percentage eligible for Medicaid, Consolidated Federal Funds, population growth and total employment number and “negatively” associated with the percentage of TANF recipients (Table 2). Gaming revenue was “positively” associated with the unemployment rate and total employment number (Table 2). Median household income was “negatively” associated with the percentage eligible for Medicaid, percentage of TANF recipients, unemployment rate and the percentage of all ages in poverty, and “positively” associated with total employment number (data not shown in tables). Sales tax revenue was “negatively” associated with the unemployment rate and population growth, and “positively” associated with the total employment number (data not shown in tables).

The three “healthcare outputs” variables—local health department expenditures, emergency medical services run rate, and population to physician ratio—were not associated with either the presence of a casino in the community or gaming revenue (Table 3). Local health department expenditures was “negatively” associated with the percentage eligible for Medicaid and the unemployment rate and “positively” associated

TABLE 1 ● Trends over time results for all variables*

Variables	Tunica County			Tallahatchie County			Pemiscot County			Mississippi County		
	1994 [†]	2004	% change	1994 [†]	2004	% change [‡]	1995	2004	% change	1995	2004	% change
Economic												
Gaming revenue, \$\$	5,696	45,501	698	0	0	...	572	1,347	135	0	0	...
Sales tax revenue, \$\$	7,125	19,001	167	2,759	3,288	19	528	1,524	188	740	1,425	93
Per capita income, \$	13,561	19,567	44	12,239	21,119	73	14,912	23,230	56	14,719	21,754	48
Median Household income, \$ [¶]	13,337	26,161	96	14,596	23,053	58	19,592	24,051	23	20,137	25,210	25
Socioeconomic												
Percentage eligible for Medicaid	42.7	40.2	- 6	34.7	38.1	10	33.9	45	33	28.2	37	31
Consolidated federal funds, \$\$	43,549	77,744	79	75,949	132,959	75	110,691	222,215	101	67,213	123,649	84
Unemployment rate	10.3	8.6	- 17	13.1	9.5	-27	12.1	9	-26	9.3	7.5	-19
Percentage of TANF recipients	13.7	0.6	- 96	9.6	1.3	-86	15.2	8.4	-45	13	14.7	13
Total employment number	8,444	17,055	102	4,426	5,032	14	8,218	8,140	-1	5,233	5,732	10
Poverty rate [¶]	43.4	22.4	- 48	38.9	25.6	-34	32.1	23.1	-28	29	20.5	-29
High school graduation rate	79	87.4	11	61.6	62	1	76.1	78.5	3	62.3	83.4	34
Population growth	8,148	10,066	24	14,752	14,255	-3	21,103	19,571	-7	13,895	13,697	-1
Violent crime rate [#]	208.6	135.8	- 35	223.7	145.7	-35	378.6	563.6	49	179.9	540	200
Healthcare outputs												
Local health department expenditures, \$	307,156	232,878	- 24	574,079	564,552	- 2	455,367	598,112	31	326,481	619,435	90
Population-to-physician ratio	4,110.1	3,355.1	- 18	2,090.1	2,851.1	36	1,409.1	1,305.1	-7	6,948.1	3,424.1	-51
Emergency medical services run rate	15.8	28.8	82	2.5	6.1	144	13.1	16.4	25	NA	13.4	
Health outcomes												
First-trimester prenatal care rate	63.3	53.7	- 15	74.8	77.7	4	76.1	68.6	-10	78.8	89.2	13
Percent birth to teens	32.2	18.8	- 42	33.2	25.1	-24	34.3	24.3	-29	36.1	22.8	-37
Motor vehicle death rate	61.4	29.8	- 51	54.2	42.1	-22	23.7	15.3	-35	57.6	36.5	-37
Infant mortality rate**	16.8	16.8	0	12.1	10.9	-10	10.6	7.9	-25	18.0	11.4	-37
Low birth weight rate	10.9	12.8	18	12.5	6.1	-51	12.6	12	-5	14.1	13.0	-8
Years of potential life lost rate	134.5	98.6	- 27	168.8	90.5	-46	92.1	81.5	-12	113.4	87.2	-23
Overall mortality rate ^{††}	1,238.1	1,192.9	- 4	1,019.9	947.2	-7	1,324.0	968.3	-27	1,283.0	1,165.0	-9

*NA indicates data not available.
[†]Values were calculated for this baseline year as an average of 1993 and 1994. If a value was missing, the value available for either of the years was used.
[‡]Ellipses indicate percentages not calculated.
[§]Dollars in thousands.
^{||}P < .05 indicating statistically significant.
[¶]2004 data were not available. Data in the table are actual 2003 data.
[#]2004 data were not available. Data in the table are actual 2002 data.
^{**}5-year moving average rate per 1,000 live births.
^{††}Per 100,000 persons.

TABLE 2 ● First-step regression results for socioeconomic drivers of healthcare output*

Variables	Casino		Gaming revenue	
	T value	P	T value	P
Percentage eligible for Medicaid	3.06	.005	1.78	.09
Consolidated Federal Funds	5.27	<.001	-0.69	.50
Percentage of TANF recipients	-3.25	.003	0.19	.85
Unemployment rate	-0.52	.61	2.64	.01
Total employment number	10.50	<.001	4.26	<.001
All ages in poverty rate	0.96	.35	1.03	.31
High school graduation rate	1.59	.12	-1.86	.07
Population growth	5.79	<.001	0.59	.56
Violent crime rate	-1.44	.17	0.29	.78

*Independent variables were casino presence, gaming revenue, state, year, per capita income, median household income, and sales tax revenue.

with the percentage of TANF recipients (data not shown in tables). The population-to-physician ratio was “negatively” associated with population growth (data not shown in tables).

The presence of a casino in the community was not associated with any of the health outcomes while gaming revenue was associated with only two of the seven health outcomes once other intermediate socioeconomic variables were included as predictors (Table 4). Per capita income, percentage of TANF recipients, and population growth were “positively” associated with first-trimester prenatal care (data not shown in tables). The percentage eligible for Medicaid was “negatively” associated with first-trimester prenatal care rate, and the total employment number was “negatively” associated with infant mortality rate (data not shown in tables).

● **Discussion**

Over the past two decades, legalized gambling as an emerging public health threat has drawn the interest of researchers. Most of the attention has been on so-

TABLE 3 ● Second-step regression results for healthcare outputs*

Variables	Casino		Gaming revenue	
	T value	P	T value	P
Local health department expenditures	0.57	.57	0.57	.57
Population-to-physician ratio	-0.50	.62	0.57	.57
Emergency medical services run rate	0.19	.85	-1.03	.28

*Independent variables were casino presence, gaming revenue, state, year, per capita income, median household income, sales tax revenue, percentage eligible for Medicaid, percent of TANF recipients, unemployment rate, total employment number, consolidated federal funds, and population growth.

TABLE 4 ● Third-step regression results for health outcomes*

Variables	Casino		Gaming revenue	
	T value	P	T value	P
First-trimester prenatal care	0.57	.57	2.22	.04
Percent births to teens	-0.50	.62	-0.98	.34
Motor vehicle death rate	1.40	.18	1.66	.11
Infant mortality rate [†]	1.94	.07	2.61	.02
Low birth-weight rate	-0.34	.74	-0.51	.62
YPLL under age 65 [‡]	-0.97	.34	0.98	.34
Overall mortality rate [§]	0.43	.67	-0.73	.47

*Independent variables were casino presence, gaming revenue, state, year, per capita income, median household income, sales tax revenue, percentage eligible for Medicaid, percentage of TANF recipients, unemployment rate, total employment number, consolidated federal funds, and population growth.

[†]Five-year moving average rate per 1,000 live births.

[‡]YPLL indicates years of potential life lost.

[§]Per 100,000 persons.

cioepidemiological examinations to identify, predict, prevent, and treat addictive disorders such as pathological or problem gambling.²⁰⁻²² However, some researchers have noted potential health benefits of gaming (eg, social interaction, increased coping capacities, adult play).^{2,23}

While this study did not test for those factors, it found that there was a lack of association between “casino presence” and desirable social and health related outputs, and health outcomes. The infant mortality rate, considered a traditional indicator of community health status, had a statistically significant decrease in the noncasino counties Tallahatchie and Mississippi, and the 2004 infant mortality rate in Tunica County (16.8 per 1,000 live births) is higher than that in some developing countries. A previous large-scale gaming study also found no significant changes in infant mortality as well.²⁴ The first-trimester prenatal care variable, another traditional indicator of community health status, decreased significantly in one casino county, Pemiscot, and increased only in a noncasino county, Mississippi. Finally, this study revealed that the county with the largest increase in health department expenditures was a noncasino county, Mississippi. It is notable that although there was a statistically significant decrease in overall mortality in a casino county during the study period, no significant association was found between casino (presence or gaming revenue) and overall mortality. It is also notable that although gaming revenue was found to be positively related with first-trimester prenatal care, a factor known to reduce infant mortality,²⁵ it was “positively” associated with infant mortality. Other contradictory findings were the negative associations of health department expenditure with percentage eligible for Medicaid and the unemployment rate. A partial explanation for these contradictions

is the influence of other fundamental economic variables on the outcomes studied. For example, as expected, median household income was “positively” associated with the total employment number and “negatively” associated with the unemployment rate, percentage of population in poverty, percentage eligible for Medicaid, and percentage of TANF recipients. Also expected was the negative association between the total employment number and infant mortality and the positive associations between per capita income and first-trimester prenatal care.

In addition, published evidence supports findings in this study of a mixed effect of casino revenue on major socioeconomic indicators.^{7,24} Shafer noted that impoverished communities do have significant economic impacts from casinos, but cautioned that long-term economic benefits “must be sustainable to have a positive health impact.”^{24(p22)} The changed topography in Tunica County’s physical and economic environment since the advent of casino gaming is profound. Gaming industry revenue from Mississippi casinos totaled \$2.8 billion in fiscal year 2004, an 89.8 percent increase over 1994.³ Tunica County casinos generated more than \$1.1 billion of that total.³ Total gaming-related revenues earned for the state were \$332.2 million in fiscal year 2004.²⁶ According to data provided in a September 2005 interview with the Tunica County Controller, Tunica County casinos earned \$45.5 million of that revenue for the county. This is up considerably for Tunica County from the 1994 level of less than \$5.7 million. These revenues have been used primarily for infrastructure repairs and improvements, public safety, housing, education, and transportation.³ Tunica County per capita income was \$19,567 in 2004, up 44 percent from 1994.²⁷ In 2004, 42 percent of all casino workers in the state worked in Tunica County casinos.²⁸ The total employment number in 2004 was 17,055, down from the highest level in 2000 of 19,485, but up 102 percent from the baseline used in the study.²⁹ While this figure does include part-time jobs, it is 69 percent higher than the total county population, a probable indication of high employment of casino workers that reside outside of Tunica County. In fact, the Tunica County unemployment rate was constant for 2003 and 2004 at 8.6 percent, an increase of 2.7 percent over 2002, but certainly down from the 1994 rate of 10.3 percent.²⁹ Tallahatchie County per capita income in 2004 was \$21,119, 73 percent above 1994 and surpassed Tunica county levels for the last two consecutive years (2003 and 2004).²⁷ This observation over longer periods could be supported by findings in other reports that casinos may generate more but not necessarily better jobs that impact per capita income and overall living standards.²⁴

In Pemiscot County, according to data provided by the City of Caruthersville County Clerk (Wanda.

Meller@dor.mo.gov) on March 14, 2006, gaming revenues to the City of Caruthersville from Casino Aztar totaled \$1.3 million in 2004, up from just over \$.5 million in 1995, and per capita income was \$23,230, up 56 percent,²⁷ while the total employment number was down 1 percent since 1995.²⁹ In Mississippi, a county without a casino, per capita income in 2004 was \$21,754, up 48 percent since 1995,²⁷ while total employment number increased 10 percent since 1995.²⁹ Gross gaming receipts from all Missouri casinos in 2004 were \$1.4 billion with \$22 million coming from Casino Aztar.³⁰ Total state gaming revenue earned on those receipts in the same period was \$387 million.³⁰ The impact of Caruthersville’s new resources from gaming revenues is most evident in city infrastructure improvements. Uses of gaming revenues included public safety, water and drainage, street improvements, and other important infrastructure developments.³⁰

The literature also provides some support for our finding of a mixed or lack of association of casino revenue on healthcare.^{23,24} Tunica County funding to the local health department (a state government agency) rose annually from \$41,000 in 1994 to only \$69,200 in 2004,³¹ while the total local health department expenditures decreased. However, the county utilized casino revenues to promote health with the development of state-of-the-art Aquatic and Health and Wellness Centers, a positive community and policy approach to improving health by altering environmental factors.³² Also, in the interview with the County Controller, it was revealed that Tunica County supported two non-profit medical clinics with approximately \$900,000 in annual payments until the county purchased the clinics in 2002. There is a hospital in the noncasino county, Tallahatchie, but none in Tunica County. In 2005, the state Certificate of Need program did not approve Tunica County’s application to build a hospital that would have replaced the one that closed in 1991. In another casino county, Pemiscot, the city’s Mayor indicated in a phone interview in August 2006 that casino revenues do not contribute to the support of the county health department (a county government agency) or the community health and wellness and aquatic centers built in the city. However, the city did use casino revenues to invest in new outdoor sports facilities (ie, baseball and soccer fields) and in 2004, \$25,000 was provided to a nursing home located in the city.³⁰ There is a hospital in Pemiscot County, but Mississippi County, a noncasino county, does not have a hospital.

● Summary

In this study, improvements in health outcomes were not identified nor was funding substantially increased

for local public health services as a result of casino gaming. Generally, there was a lack of association between the presence of a casino and positive changes in health-care delivery and health status.

There were many limitations to this study. A major limitation is the ecological analysis with “aggregated data at the county level” used to derive interpretation of associations at the “individual level.” For example, one cannot be certain whether an infant who had no prenatal care or who died in the first year of life was born to a family that was economically affected by casino revenue. All we know is that on average, families from communities with low rates of prenatal care and high infant mortality have also experienced economic changes attributed to casino revenue. Another major limitation primarily results from the analysis of such a small dataset, which made the regression model results inefficient (ie, large standard errors), thus increasing the probability of not finding an association that is true. However, the parsimonious modeling strategy and the aggregation of 11 years of data for all four counties achieved a balance in each model between the numbers of independent variables (eg, maximum of 13 independent variables in each of the step three final level models) and the data points, thus allowing for minimally stable models. Also as indicated earlier, the logic model was also not fully comprehensive and lacked many variables that could have helped explain the study’s regression model outcomes.

However, this analysis did have value. One of the main benefits was the ability to test the feasibility of a proposed exploratory logic model by effectively conducting a complex analysis using readily available public data. The three-step modeling used in the regression allowed for incorporation of casino presence, casino gaming revenue, and other socioeconomic effects on healthcare and health outcomes that were nonoverlapping. Policy makers should consider evidence from this and similar analytical approaches applied to a larger dataset when debating economic development strategies. Also, once economic development strategies are implemented, routine assessments such as this should be a fundamental public health activity and should be considered as necessary to increase knowledge on health outcome trends and shifts in socioeconomic status that may be anticipated to accrue in communities over time. A recent study has raised doubts on whether “health has a first-order impact on economic growth,”^{33(p33)} making further examinations for associations of economic development and health very essential to expanding knowledge in this area. Without this basic knowledge, decisions will not be supported by evidence and course corrections or strategies for improvement (ie, dedicated gaming tax revenues for pub-

lic health functions) will not emerge. On the basis of these observations, it is recommended that a larger-scale study be repeated using all counties in the two states or even all US counties. Similar studies utilizing this model could be applied to test other hypotheses related to changing social determinants as a means of improving health outcomes as well.

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