# Suicide and Gambling: An Analysis of Suicide Rates in U.S. Counties and Metropolitan Areas

September 1998


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# EXECUTIVE SUMMARY

## I. Introduction

Suicide ranks ninth among causes of death in the United States, accounting for 30,000 deaths annually. Because suicide is a premature and preventable cause of death, it is a primary public and mental health concern. The rapid expansion of gambling in the United States has initiated a new concern for the public health community. In a recent issue of *Suicide and Life-Threatening Behavior,* David P. Phillips and his colleagues at the University of California – San Diego report a strong, significant relationship between suicide and casino gambling. Specifically, Phillips *et al.* find that

- Residents of three gaming areas — Las Vegas, Reno and Atlantic City — have higher suicide levels than residents of nongaming areas.
- Visitors to Las Vegas, Reno and Atlantic City have higher suicide levels than visitors to nongaming areas.

Based on these findings, Phillips *et al.* conclude that

> (G)ambling or some factor closely associated with gambling settings is linked to elevated suicide levels. Our findings raise the possibility that the recent expansion of legalized gambling and the consequent increase in gambling settings may be accompanied by an increase in U.S. suicides (Phillips *et al.*, 1997, 378).

To explore this possibility, our research group at the University of California – Irvine replicated and expanded on the Phillips *et al.* analyses. Our findings are substantially different. We find that

- The risk of suicide for gaming area residents is no higher than the risk faced by residents of nongaming areas. This finding is based on before/after analyses of six U.S. counties with gaming resorts (Atlantic, N.J.; Lawrence, S.D.; Douglas and Gilpin, Colo.; Harrison, Miss.; and Will, Ill.). When gambling was legalized in these counties, resident suicide *rates did not rise by more than what would be expected of chance alone.*
- The risk of suicide for visitors to gaming areas is no higher than the risk faced by visitors to nongaming areas. When 91 U.S. metropolitan areas are ranked by visitor suicides *in proportion to their visitor volume,* there is no relationship between the gambling and suicide by visitors. Controlling for visitor volume, Las Vegas and Reno (Nevada) and Atlantic City (New Jersey) rank 26th, 37th and 87th, respectively.

*In short, our analysis finds no evidence to support the proposition that residents or visitors of gaming areas — including Atlantic City, Las Vegas and Reno — face higher-than-average risks of suicide.*

## II. Why People Believe Gambling Could Lead to Suicide

There is a common-sense belief that suicides are triggered by stressful events such as the depression following large gambling losses. Evidence of the common belief that gambling is associated with a depressing and self-destructive lifestyle is apparent in artistic works, from Dostoevsky's *The Gambler* to popular music and news media portrayals. For example,

> One trip was all it took to turn Emmett Roberts' life inside out. The quiet electronics technician from Harper Woods gambled daily after his first visit in 1994. When he ran out of money, he went into debt. Owing more than $200,000, he began stealing at work. Roberts stopped showing up for work after the company found he had embezzled $200,000. A criminal in hiding, he passed bad checks for quick cash to gamble. By July, 1995, Roberts said he felt suicide was the only answer. He was arrested two days before he could carry out a plan to end his life. That type of emotional tail-spin is not uncommon in gambling towns, a recent study shows. Cities with casinos have suicide rates four times higher than cities without gambling, researchers found. Even the rate of suicides among visitors to casino communities is higher than that of tourists who visit sites without gambling, the study showed (DeHaven, 1998).

This common-sense belief is consistent with the views of clinicians who have linked problem or pathological gambling to dysfunctional behaviors ranging from theft (LaDouceur *et al.*, 1994) to family and work disruption (Lesieur, 1998) to suicide (Kezwer, 1995).

Even so, neither common sense nor clinical experience with a small pathological subpopulation can replace a controlled scientific investigation.

## III. Resident Suicides Before and After Gambling Legalization

Since gambling was legalized in Nevada more than 35 years before the advent of modern mortality statistics, before/after contrasts are not possible for Las Vegas or Reno. In Atlantic City, on the other hand, as well as in several lesser known gambling areas, such comparison is possible. For that, we selected six U.S. counties.[1]

- Atlantic County, N.J.: Atlantic County's 1990 population of 224,327 is 77 percent white. Gambling was legalized in 1978. Atlantic County is the only before/after analysis already reported in the literature (Phillips *et al.*, 1997).
- Lawrence County, S.D.: Located in western South Dakota, Lawrence County's 1990 population of 20,655, is 96 percent white. The county seat, Deadwood, is near Mount Rushmore. Since 1989, 25 casinos have located in Deadwood.
- Gilpin and Douglas counties, Colo.: Douglas County's 1990 population of 60,391 is 97 percent white; Gilpin County's 1990 population of 3,070 is also 97 percent white. Located within driving distance of Denver, both counties have more than two dozen casinos. Significant gambling activity began in 1991.
- Harrison County, Miss.: Located on the Gulf of Mexico, Harrison County's 1990 population of 165,365 is 77 percent white. The major cities are Gulfport and Biloxi. Significant gambling activity began in 1992.
- Will County, Ill.: Located 40 miles south of Chicago, Will County's 1990 population of 357,313 is 85 percent white. Significant gambling activity began in 1992.

In each of these counties, a burst of development, following legalization, effectively separated the historical record into distinct pre- and post-legalization segments. If the legalization of gambling causes suicide, we expect resident-

[1] Since the Colorado counties of Douglas and Gilpin have small populations and began gambling in the same year, we have combined them for purposes of analysis.

suicide rates to rise in the post-legalization period. But in fact, with one exception, the estimated differences between pre- and post-legalization resident suicide rates are well within the limits of chance fluctuation.

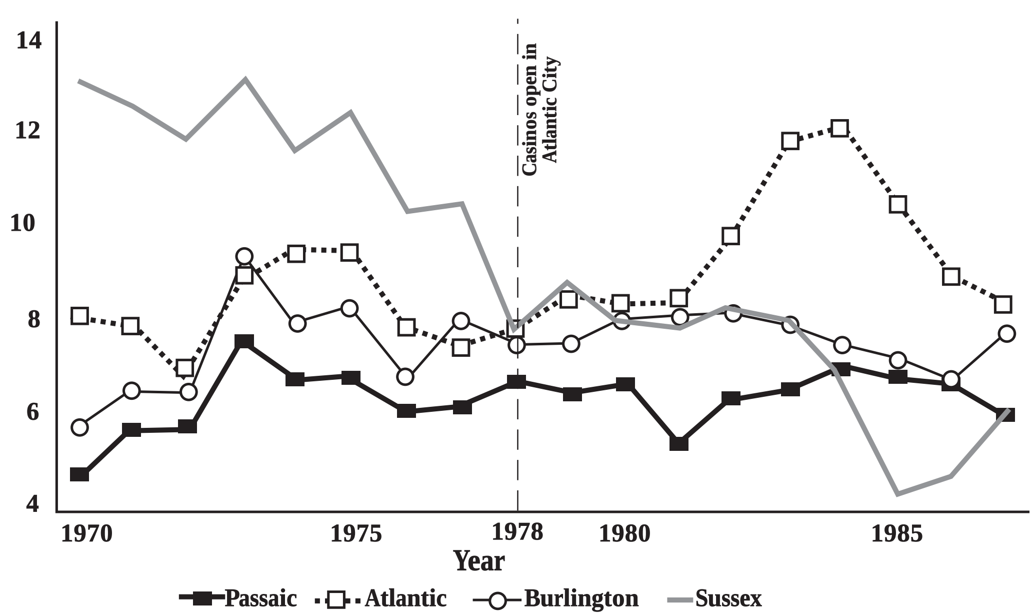
The estimated before/after differences are summarized in Table 1. To interpret this table, we adopt the common null hypothesis that assumes that any before/after change in these counties is a statistical "fluke," the result of simple chance. This null hypothesis is rejected if the before/after difference is so large that it could occur by chance only one time in 20 (i.e., with a probability smaller than .05). As shown in Table 1, however, only one of the before/after differences has a probability smaller than .05; in that case — Lawrence County, S.D. — the difference amounts to a drop of 9.7 suicides per 100,000 residents.

TABLE 1 - BEFORE/AFTER STATISTICS FOR SIX COUNTIES

| | **Before** | **After** | **Change** | **p(t)** |
|---|---|---|---|---|
| Atlantic, NJ | 8.62 | 9.28 | +.659 | .773 |
| Lawrence, SD | 19.25 | 9.52 | -9.726 | .004 |
| Douglas-Gilpin, CO | 18.59 | 14.19 | -4.430 | .115 |
| Harrison, MS | 12.83 | 15.12 | 2.291 | .910 |
| Will, IL | 9.64 | 8.22 | -1.423 | .159 |

Given its salience and size relative to the other counties, Atlantic County, N.J., is the most important of these five cases. As shown in Table 1, Atlantic County's resident suicide rate in the years prior to legalization was 8.62 per 100,000. After legalization, the rate rose by .66 per 100,000. The probability associated with an increase of this size, reported in the column labeled "p(t)," is .773, however. Since an effect of this size or larger could occur by chance more than 77 percent of the time, we conclude that the before/after difference in Atlantic County is a chance variation.

**FIGURE 1 - RESIDENT SUICIDE RATES IN FOUR NEW JERSEY COUNTIES**



The time series plotted in Figure 1 puts this analysis in the context of scientific control. These data are annual resident suicide rates for four New Jersey counties before and after legalization of gambling in 1978. The Atlantic County series (the **dotted** line) rises and falls in short cycles throughout its history. A short cycle in 1983-85 gives the visual impression of an increase following legalization. In fact, however, this change is part of a natural pattern of drift in the series.

The **thin black** line shows annual rates for Burlington County, which lies directly to the north. If legalization led to an increase in resident suicide rates in Atlantic County, one might expect to see similar effects in Burlington and other neighboring counties (Ocean, Cape May and Camden). But in fact, legalization appears to have no impact on Burlington County's series, and the same can be said of Ocean, Cape May and Camden counties. The **heavy black** and **heavy gray** lines are annual rates for Passaic and Sussex counties, respectively. Passaic and Sussex are as far from Atlantic County as it is possible to be and still be in New Jersey. Yet forced to pick a county that "looked like" legalization had an impact, Sussex would be a good choice — albeit the effect would be drop in the resident suicide rate. Likewise, if one were forced to pick a county where it "looked like" legalization had no effect, Passaic would be a good choice.

These control counties illustrate the range of behavior that is typical of New Jersey's annual resident suicide rates. In the context of control, Atlantic County's rates before and after legalization are unremarkable.

## IV. Visitor Suicides

In addition to increased suicide levels among residents, Phillips *et al.* report increased suicide levels for visitors to Atlantic City, Las Vegas and Reno. Analyses of visitor suicides pose a more difficult problem in one respect. Whereas the annual resident populations required for computing resident suicide rates are readily available, annual visitor populations are not. In light of this problem, Phillips *et al.* analyze a cross-section of proportionate mortality ratios. Ignoring for now the technical details, Phillips *et al.* find that Las Vegas, Reno and Atlantic City rank first, fourth and 10th among U.S. metropolitan areas. Since proportionate mortality ratios are *not* rates, of course, this statistical anomaly has two equally plausible interpretations.

- The high rankings for Las Vegas, Reno and Atlantic City can mean that *gambling causes suicide;* or
- The high rankings for Las Vegas, Reno and Atlantic City can mean that the three cities have high numbers of interstate visitors.

The fact that Florida has relatively more visitor traffic fatalities than Wyoming need not imply that driving in Florida is riskier than driving in Wyoming or that Florida's tourists are worse drivers than Wyoming's. On the contrary, it is more likely that Florida has more visitor traffic fatalities than Wyoming because it has more visitors. This example illustrates the need for rates.[2] Rates ensure that cross-sectional analyses will compare apples to apples and oranges to oranges. If the numbers of visitors to U.S. counties had been available, Phillips *et al.* could have analyzed visitor suicide rates. This would have shown that, while Las Vegas, Reno and Atlantic City have high levels of visitor suicides, their visitor suicide rates are quite ordinary.

[2] To be fair, Phillips *et al.* recognize this shortcoming of their statistic: "A preferable measure, suicide rate (*i.e.*, adult suicides/number of adult out-of-state visitors), cannot be calculated because the denominator is unknown." (p. 374)

We used the *1995 American Travel Survey*[3] to calculate visitor suicide rates for U.S. metropolitan areas. Table 2 lists the visitor suicides per million overnight trips for 91 metropolitan areas that had at least one visitor-suicide in 1995. Visitor suicide rates range from 8.01 visitor-suicides per million trips in Hamilton, Ohio (part of the greater Cincinnati-Hamilton metropolitan area), to .25 visitor-suicides per million trips in Newark, N.J.

The Las Vegas, Reno and Atlantic City metropolitan areas rank 26th, 37th and 87th on this list, respectively. The roughly two dozen metros with visitor suicide rates higher than Las Vegas' include areas from every region of the United States. There is no evident pattern in the distribution of casino gaming metros throughout this list. Las Vegas and Reno sit in the list's top half (along with nongaming metros Portland, Omaha and Chattanooga, for example), but Atlantic City sits near the bottom (followed mainly by metros that had no visitor suicides at all). Although the second-ranked metro area on this list, Gary, Ind., was a casino gaming metro in 1998, it had no casinos operating in 1995 when these rates were calculated.

Examining visitor suicides without controlling for visitors creates a distorted picture of the phenomenon. In 1995, for example, the Las Vegas metro area had more visitor suicides — 36 — than any other U.S. metro area. When Las Vegas' raw numbers are divided by its number of visitors to create a rate, its rank drops from first to 26th among metro areas. *When visitor volume is used to correct for the population at risk, the surface appearance of elevated visitor suicide levels in casino gaming metro areas disappears.*

## V. Discussion

Among previously published studies on the gambling-suicide link, just one, that by Phillips and his colleagues (1997), uses data for large populations over time. In that respect it is the only earlier study that is directly comparable to ours. For that reason alone, the Phillips study is worthy of extended comparison. Even more compelling, however, is the stark contrast in the findings of the studies. Phillips found large and significant suicide risks for both residents of and visitors to casino gaming areas; we find no significant risks at all. Rarely are the findings of empirical studies so discrepant as in the present case. What explains this dramatic difference?

Some of the difference arises from our use here of a wider sample of times, places and populations. Whereas Phillips applies a before/after analysis to a single test county, the present study incorporates six test counties plus additional control counties. The enlarged sample, in concert with data drawn over a longer span of time, offer increased statistical resolution not available in the Phillips investigation. The present study, moreover, uses both counties and metropolitan areas as units of analysis, and uses every U.S. county and metropolitan area for which data are available.

But most of the discrepancy is due, in our view, to two major methodological flaws in the Phillips *et al.* study: (1) the misuse of an obscure statistic, the proportionate mortality ratio (PMR), instead of rates; and (2) the unconventional use of a "matched comparison group." We will discuss these two flaws in order.

### 1. The Proportionate Mortality Ratio (PMR)

Phillips *et al.* interpret differences in suicide PMRs as differences in suicide risks. Unfortunately, PMRs cannot be interpreted as risk statistics. The suicide PMR is defined as the ratio of suicide deaths to total deaths.

$$\mathbf{PMR} = \frac{\textbf{Suicide Deaths}}{\textbf{Total Deaths}}$$

[3]The *1995 American Travel Survey* consists of data on trips of at least 100 miles with destinations in metropolitan areas. Data were compiled from travel diaries kept by a sample of 80,000 persons throughout 1995.

TABLE 2 - VISITOR SUICIDES PER MILLION TRIPS TO METROPOLITAN AREAS

| | Metro Area | Rate | | Metro Area | Rate |
|---|---|---|---|---|---|
| 1 | Hamilton, OH | 8.008 | 46 | Grand Rapids, MI | 1.399 |
| 2 | Gary, IN | 6.298 | 47 | Kansas City, MO | 1.398 |
| 3 | Wilmington, DE | 5.003 | 48 | Dutchess County, NY | 1.375 |
| 4 | Jersey City, NJ | 4.967 | 49 | San Jose, CA | 1.335 |
| 5 | Lakeland, FL | 4.816 | 50 | Norfolk, VA | 1.311 |
| 6 | Trenton, NJ | 4.219 | 51 | Allentown, PA | 1.266 |
| 7 | Portland, OR | 3.780 | 52 | Lancaster, PA | 1.219 |
| 8 | Toledo, OH | 3.713 | 53 | Philadelphia, PA | 1.211 |
| 9 | Daytona Beach, FL | 3.700 | 54 | Spokane, WA | 1.176 |
| 10 | Chattanooga, TN | 3.692 | 55 | Albany, NY | 1.155 |
| 11 | Memphis, TN | 3.615 | 56 | Erie, PA | 1.134 |
| 12 | Colorado Springs, CO | 3.226 | 57 | Greenville, SC | 1.112 |
| 13 | Jacksonville, FL | 3.062 | 58 | Miami, FL | 1.101 |
| 14 | Washington, DC | 2.816 | 59 | Buffalo, NY | 1.034 |
| 15 | Ft. Lauderdale, FL | 2.770 | 60 | Appleton, WI | 1.013 |
| 16 | Omaha, NE | 2.429 | 61 | Denver, CO | .990 |
| 17 | Honolulu, HI | 2.357 | 62 | Chicago, IL | .839 |
| 18 | Vallejo, CA | 2.284 | 63 | Seattle, WA | .831 |
| 19 | Greensboro, NC | 2.248 | 64 | Corpus Christi, TX | .831 |
| 20 | Columbia, SC | 2.192 | 65 | San Francisco, CA | .824 |
| 21 | Melbourne, FL | 2.163 | 66 | Dayton, OH | .809 |
| 22 | Provo, UT | 2.138 | 67 | Sarasota, FL | .804 |
| 23 | Wichita, KS | 2.137 | 68 | Minneapolis, MN | .772 |
| 24 | Middlesex-Somerset, NJ | 1.988 | 69 | Oklahoma City, OK | .761 |
| 25 | Phoenix, AZ | 1.950 | 70 | Charleston, WV | .739 |
| 26 | Las Vegas, NV | 1.914 | 71 | Nassau-Suffolk, NY | .732 |
| 27 | Baltimore, MD | 1.854 | 72 | West Palm Beach, FL | .730 |
| 28 | Cincinnati, OH | 1.805 | 73 | Oakland, CA | .726 |
| 29 | New Orleans, LA | 1.803 | 74 | Los Angeles, CA | .707 |
| 30 | Charleston, SC | 1.802 | 75 | Bergen, NJ | .695 |
| 31 | Salt Lake City, UT | 1.752 | 76 | San Diego, CA | .614 |
| 32 | Stockton, CA | 1.732 | 77 | Ft. Worth, TX | .604 |
| 33 | South Bend, IN | 1.688 | 78 | Flint, MI | .586 |
| 34 | St Louis, MO | 1.680 | 79 | Dallas, TX | .572 |
| 35 | Louisville, KY | 1.669 | 80 | Providence, RI | .562 |
| 36 | Eugene, OR | 1.640 | 81 | Detroit, MI | .545 |
| 37 | Reno, NV | 1.640 | 82 | Bakersfield, CA | .533 |
| 38 | Madison, WI | 1.628 | 83 | Salinas, CA | .436 |
| 39 | El Paso, TX | 1.575 | 84 | Houston, TX | .433 |
| 40 | Pittsburgh, PA | 1.571 | 85 | Sacramento, CA | .410 |
| 41 | Tucson, AZ | 1.562 | 86 | Milwaukee, WI | .359 |
| 42 | Canton, OH | 1.498 | 87 | Atlantic City, NJ | .317 |
| 43 | Riverside, CA | 1.467 | 88 | Columbus, OH | .297 |
| 44 | Tampa, FL | 1.462 | 89 | San Antonio, TX | .273 |
| 45 | Cleveland, OH | 1.457 | 90 | Orlando, FL | .250 |
| | | | 91 | Newark, NJ | .246 |

Compared to other epidemiological measures, the PMR seems to cause the greatest confusion in its description and use. According to Mausner and Kramer (1985) — the source cited by Phillips *et al.* — the PMR is

> ... often confused with the cause-specific death rate. [The PMR] tells us the relative importance of a specific cause of death in relation to all deaths in a population group. (Mausner and Kramer, 1985: 99)

Mausner and Kramer (1985) are clear on this point: The PMR cannot be given the risk interpretation that Phillips *et al.* would like:

> Note that the PMR is not a rate, since the denominator is derived from deaths and not from the population at risk. [The PMR] answers the question, 'What proportion of deaths is attributable to disease X?' In contrast, a cause-specific death rate answers the question, 'What is the risk of death from disease X for members of a population?' (Mausner and Kramer, 1985: 99)

Suicide PMRs have another interpretation, and Mausner and Kramer (1985) — the source cited by Phillips *et al.* — are clear on that point:

> From the viewpoint of public health, the PMR is useful because it permits estimation of the proportion of lives to be saved by eradication or reduction of a given cause of death. On the other hand, PMRs can be misleading. Because the denominator refers to total deaths, its magnitude depends on the number of deaths from other causes besides the condition under consideration. (Mausner and Kramer, 1985: 99-100)

The misuse of PMRs can be illustrated with a simple example. Suppose that suicide and all other deaths in populations A and B are distributed as the following:

| | **A** | **B** |
|---|---|---|
| **Population at Risk** | **100,000** | **100,000** |
| **Suicides** | **10** | **10** |
| **All Deaths** | **900** | **400** |
| | | |
| **Suicide Rate** | **.0001** | **.0001** |
| **PMR** | **.0111** | **.0250** |

With this distribution, populations A and B have not only the same number of suicides (10) but, more important, the same suicide rates (10 per 100,000). Yet their suicide PMRs are very different. In this case, as in any other, it is a serious error to interpret differences in PMRs — gaming *vs.* nongaming communities, *e.g.* — or changes in PMRs — before *vs.* after, *e.g.* — as differences or changes in risk.

Phillips *et al.* are concerned with the effects of gambling on suicide risk and acknowledge that the suicide-specific mortality rate (SSMR) is preferable to the "suicide level" (PMR) that they employed:

> "Suicide level" is measured here as adult suicides [as a proportion of] total adult deaths. A preferable measure, the suicide rate (*i.e.*, adult suicides/number of adult out-of-state visitors), cannot be calculated because the denominator is unknown. (Phillips *et al*, 1997: 374)

We agree, then, that the only appropriate statistic for the purpose of evaluating risk is the *suicide rate*, which controls for differences in population at risk.[4]

Conventional statistical and epidemiological practice dictates the use of suicide rates rather than PMRs. Comparisons based on suicide rates are apple-to-apple comparisons. As our report demonstrates, the use of PMR statistics by Phillips *et al.* results in apple-to-orange comparisons.

## 2. Matched Control Groups

"Control" is the *sine qua non* of valid inference. In before/after analyses, one must show not only that resident suicide risk rises in affected (gaming) areas but, also, that resident suicide risk does *not* rise in unaffected (nongaming) areas. Likewise, in cross-sectional analyses, one must demonstrate not only a positive correlation between gaming and visitor suicides but, also, the absence of a correlation between gaming and visitor volume. We used control counties and visitor suicide rates for this purpose. Phillips *et al.* used a "matched" control group.

Although matching is a well-accepted method for building control groups, to succeed, the investigator must match the control group on *all* important risk variables. In their analysis of interstate visitor suicides, Phillips *et al.* matched on sex, race and age but failed to match on the most important risk factor of all: the amount of time spent traveling. To illustrate the methodological flaw in their procedure, consider the case of two hypothetical decedents, A and B, with the following characteristics:

| | | A | B |
|---|---|---|---|
| **Known** | **Sex** | **Male** | **Male** |
| **Known** | **Race** | **White** | **White** |
| **Known** | **Age** | **58** | **58** |
| **Known** | **Residence** | **Arizona** | **Arizona** |
| **Unknown** | **Out-of-State Time** | **30 days** | **15 days** |
| **Unknown** | **Risk-years** | **.0822** | **.0411** |

Decedent A is a white male who committed suicide in Las Vegas at age 58; decedent A was an Arizona resident at the time of death. Decedent B was selected from a death certificate database because he "matched" decedent A on all *known* characteristics. With respect to visitor suicide risk, however, decedent A's most important characteristic is *unknown.* Because the amount of time that decedent A spent out of state in his last year of life is not listed on his death certificate, his visitor suicide risk is unknown and, thus, cannot be controlled. In this hypothetical case, decedent A spent 30 days out of state in his last year of life (vs. 15 days for decedent B). As a result, decedent A's visitor suicide risk is exactly twice as large as decedent B's.

[4]Suicide totals in the rate numerator ar available from the National Center for Health Statistics (1997), the same source used by Phillips *et al.* The population at risk totals in the rate denominator are available from the U.S. Bureau of the Census (1997). Since both data sources are consistently reported at the county level, we use counties as the lowest unit of analysis.

## VI. Conclusion

Suicide takes 30,000 lives annually and is the focus of significant public health prevention efforts. Should these efforts encompass legalized gambling? Does legalized gambling elevate suicide rates? In a widely publicized article published in *Suicide and Life-Threatening Behavior* in 1997, David P. Phillips and his co-authors report a strong and positive relationship between suicide and casino gambling. An analysis of suicides in three casino gambling counties (Clark and Washoe counties in Nevada and Atlantic County in New Jersey) leads the Phillips team to conclude that

> (G)ambling or some factor closely associated with gambling settings is linked to elevated suicide levels. Our findings raise the possibility that the recent expansion of legalized gambling and the consequent increase in gambling settings may be accompanied by an increase in U.S. suicides. (Phillips *et al.,* 1997, 378)

Our re-analysis of this issue shows that the findings of Phillips and his co-authors are fatally flawed by the use of nonstandard statistics, and by the failure to control the masking effects of factors like population growth, age structure and visitor volume. *When standard statistics are used, and when the masking effects of extraneous factors are controlled, suicide levels in Atlantic City, Las Vegas, Reno and other U.S. casino resort areas are about average compared to nongaming areas.*

The Phillips *et al.* study has two major methodological flaws. The first flaw is the *misuse* of an obscure statistic, the proportionate mortality ratio (PMR), resulting in apple-to-orange comparisons. The second flaw is the unconventional use of a "matched comparison group." In analyzing interstate visitor suicides, the Phillips team fails to match on the most important risk factor of all: the amount of time spent traveling. These weaknesses, in concert with additional minor flaws, are sufficient to invalidate the Phillips *et al.* study on methodological grounds alone.

What happens when more conventional methods are used to investigate the link between legal gaming and suicide risk? The research reported here analyzes separately both resident and visitor suicides in gaming and nongaming settings. Based on complementary cross-sectional (comparing many places — gaming and nongaming — at a single point in time) and longitudinal analyses (comparing a few places over a long period "before" and then "after" the advent of casino gambling), the research has two findings.

- For gaming-area residents, the risk of suicide is no higher than that faced by residents of nongaming areas. Before/After analyses of six U.S. gaming resort counties (Atlantic, N.J.; Lawrence, S.D.; Douglas and Gilpin, Colo.; Harrison, Miss.; and Will, Ill.) show that following the legalization of gambling, suicide rates *did not change by more than what would be expected of chance alone.*

- For gaming-area visitors, the risk of suicide is no higher than that faced by visitors to nongaming areas. When 91 U.S. metropolitan areas are ranked by visitor suicides *in proportion to their visitor volume,* Las Vegas, Reno and Atlantic City rank an unremarkable 26th, 37th and 87th, respectively.

*In short, our investigation finds no evidence to support the proposition that residents or visitors of gaming areas — including Atlantic City, Las Vegas and Reno — face heightened risks of suicide because of the presence of gaming.*

# ABSTRACT


Suicide takes 30,000 lives annually. It is the focus of significant public health prevention efforts. Should these efforts encompass legalized gambling: does legalized gambling elevate suicide rates? In a widely publicized article published in the journal *Suicide and Life-Threatening Behavior* (1997), David P. Phillips and his co-authors report a strong and positive relationship between suicide and casino gambling. An analysis of suicides in three casino gambling counties (Clark and Washoe counties in Nevada and Atlantic County in New Jersey) leads the Phillips team to conclude that "gambling or some factor closely associated with gambling settings" result in an increased risk of suicide. Furthermore, "the recent expansion of legalized gambling and the consequent increase in gambling settings may be accompanied by an increase in U.S. suicides."

In strong contrast to the Phillips study, our investigation shows that when standard methodology is employed, and when the masking effects of extraneous factors (such as population growth, age structure, and visitor volume) are removed, suicide levels in U.S. casino resort areas are about average compared to nongaming areas. What explains these contradictory results?

In part, the divergence results from difference in sample size: the study here analyzes data from a more extensive range of populations, places and times. More important, however, are two methodological flaws in the earlier study. The first lies in the misuse of an obscure statistic — the proportionate mortality ratio *(PMR)*. To achieve apple-to-apple comparisons, standard practice dictates the use of rates; by using PMRs Phillips ends up comparing apples to oranges. The second lies in the unconventional deployment of a "matched comparison group." Matching is a standard strategy for building comparison groups, but in defining a comparison group for visitor suicides, Phillips fails to match on a crucial risk factor: the amount of time spent traveling. These major weaknesses, in concert with additional minor flaws, are sufficient to invalidate the Phillips study on methodological grounds alone.

What happens when a more standard approach is applied to investigate the linkage between legal gaming and suicide risk? The study reported here analyzes (separately) both resident and visitor suicides in gaming and nongaming settings. The study encompasses two main strategies: (1) cross-sectional analysis (comparing many places — gaming and nongaming — at a single point in time) and (2) time series analysis (comparing a few places over a long period both "before" and "after" the advent of casino gambling). Our salient findings are illustrated by the following:

I. *For resident suicides:* In "before and after" analyses for all major gaming resort counties for which data are available (Atlantic, N.J.; Lawrence, S.D.; Douglas-Gilpin, Colo.; Harrison, Miss.; and Will, Ill.), no resident suicide rate changed by more than the amount that would be expected from chance fluctuation alone, except in Lawrence County, where the suicide rate *declined.* Thus, the risk of suicide for gaming-area residents is no higher than the risk faced by residents of nongaming areas.

II. *For visitor suicides:* When the nation's 263 most populous counties are ranked by visitor suicides *in proportion to their visitor volume*, gaming and nongaming counties appear throughout the list in no distinct pattern, with Clark County (Las Vegas) and Washoe County (Reno), Nevada, and Atlantic County (Atlantic City), New Jersey, ranked 60th, 85th and 172nd, respectively. Thus, the risk of suicide for visitors to gaming areas is no higher than the risk faced by visitors to nongaming areas.

In short, our investigation finds no evidence to support the proposition that residents or visitors of gaming areas — including Atlantic City, Las Vegas and Reno — face heightened risks of suicide because of the presence of gaming.

# I. INTRODUCTION

Suicide ranks ninth among causes of death in the United States, accounting for 30,000 deaths annually. Because suicide is a premature and preventable cause of death, it is a primary public and mental health concern. The rapid expansion of gambling in the United States has initiated a new concern: Is legalized gambling associated with higher suicide rates? Much of this concern stems from a recent article in *Suicide and Life-Threatening Behavior.* In this article, Phillips *et al.* (1997) report a strong and significant relationship between suicide and casino gambling. Their finding is based on an analysis of suicides in three casino gambling counties, Clark and Washoe counties in Nevada and Atlantic County in New Jersey. Using suicide-specific proportionate mortality ratios (PMRs) to estimate expected versus observed suicide levels for residents and nonresidents during 1982-88, Phillips *et al.* find that

- Residents of gaming areas — Las Vegas, Reno and Atlantic City — have higher suicide levels than residents of nongaming areas.
- Visitors to Las Vegas, Reno and Atlantic City have higher suicide levels than visitors to corresponding nongaming areas.

Phillips *et al.* conclude that "gambling or some factor closely associated with gambling settings" result in an increased risk of suicide. Thus, "the recent expansion of legalized gambling and the consequent increase in gambling settings may be accompanied by an increase in U.S. suicides." Although this conclusion may seem logical, the relevant literature at present gives little or no support to the Phillips *et al.* finding. In one case study, for example, Lester and Jason (1989) analyze 11 suicide deaths at casinos and find that only three of the 11 were associated with gambling.

In literature dominated by case studies, of course, the Phillips *et al.* analysis is the strongest published research to date on the gambling-suicide phenomenon. The salient strength of this research is the use of a comprehensive, standardized database[1] which allows the sort of cross-sectional and longitudinal contrasts that case studies lack. However, the Phillips *et al.* analysis has shortcomings, the most salient involving a lack of scientific *control.* Most people agree that any level of suicide is "too high." But as a practical and scientific matter, it is more enlightening to couch the question in relative terms. That is,

- Are suicide rates in Las Vegas and Reno higher than the rates in other western U.S. "Sun Belt" cities?
- Are visitor suicides in Atlantic City, Las Vegas and Reno higher than in cities with the same numbers of visitors?

Couching these questions in relative terms emphasizes the importance of control. That is, do gaming areas like Atlantic City, Las Vegas and Reno have high suicide levels when major risk factors are controlled?

As the analysis presented herein will show, the initial finding by Phillips *et al.* is entirely due to their use of nonstandard statistics and methods and to their failure to control for major risk factors like population growth, age structure and number of visitors. When these factors are controlled, our analysis shows, suicide levels in Atlantic City, Las Vegas, Reno and other U.S. casino resort areas are about average compared to nongaming areas.

[1]The U.S. Mortality Detail Files are a machine readable collection of death certificates from all 50 states. These data are described in Chapter II.

A. A Critique of Phillips *et al.*

Whatever its scientific shortcomings, the Phillips *et al.* finding has common-sense appeal. Most people who have not studied suicide believe that suicides are triggered by stressful events such as the depression following large gambling losses. Evidence of the common belief that gambling is associated with depressing and self-destructive lifestyle is apparent in artistic works, from Fyodor Dostoevsky's *The Gambler* to popular music and news media portrayals. For example,

> One trip was all it took to turn Emmett Roberts' life inside out. The quiet electronics technician from Harper Woods gambled daily after his first visit in 1994. When he ran out of money, he went into debt. Owing more than $200,000, he began stealing at work. Roberts stopped showing up for work after the company found he had embezzled $200,000. A criminal in hiding, he passed bad checks for quick cash to gamble. By July, 1995, Roberts said he felt suicide was the only answer. He was arrested two days before he could carry out a plan to end his life. That type of emotional tailspin is not uncommon in gambling towns, a recent study shows. Cities with casinos have suicide rates four times higher than cities without gambling, researchers found. Even the rate of suicides among visitors to casino communities is higher than that of tourists who visit sites without gambling, the study showed (DeHaven, 1998).

This common belief is also apparent in the views of clinicians who, though familiar with pathological gambling, may be unfamiliar with suicide. The same newspaper article quotes Professor Phillips on this point.

> Economic desperation is linked to suicide. And we know that for some people, gambling is linked to economic desperation. Given the clinical evidence which consistently links compulsive gambling to suicidal thoughts or actions and given our statistics to date, if I had to bet, I would be the new towns getting casinos will behave like Atlantic City. We know Las Vegas is the premier gambling location in the world. It also seems to be the premier suicide city in the world. And Atlantic City didn't have these problems when it didn't have casinos. (DeHaven, 1998)

We cannot fault Professor Phillips for his comments; newspapers are an inappropriate forum for a scientific debate. Nevertheless, the point must be made that the Phillips *et al.* finding has received widespread, uncritical notice because it is consistent with common-sense notions of suicide and because it reinforces the conventional wisdom of clinicians who treat pathological gamblers. However, neither common-sense images of gambling nor clinical experience with the pathological fraction of the population prone to addictive behavior can substitute for controlled investigation of whether expansion of gambling promotes more suicide.

On purely scientific grounds, the Phillips *et al.* finding is most easily faulted for its unconventional design, including the use of an obscure statistic — the proportionate mortality ratio (PMR) — and the use of a "matched control group" to assess the relative size of the PMR. When more conventional statistics and control groups are used, the initial finding does not survive. We cover these two issues in detail and then note a few minor concerns that, in our opinion, contribute to the problem.

1. The Proportionate Mortality Ratio (PMR)

The Phillips *et al.* findings are based on cross-sectional contrasts of the suicide PMRs for Atlantic City, Las Vegas and Reno with the suicide PMRs for nongaming areas and on comparisons of suicide PMRs before and after the introduction of casinos in Atlantic City. Unfortunately, ratio statistics like the PMR cannot be interpreted in this way. The PMR is defined as the ratio of suicide deaths to total deaths.

$$\textbf{PMR} = \frac{\textbf{Suicide Deaths}}{\textbf{Total Deaths}}$$

Compared to other epidemiological measures, the PMR seems to cause the greatest confusion in its description and use. According to Mausner and Kramer (1985) — the source cited by Phillips *et al.* — the PMR is

> … often confused with the cause-specific death rate. [The PMR] tells us the relative importance of a specific cause of death in relation to all deaths in a population group. (Mausner and Kramer, 1985: 99)

Mausner and Kramer (1985) are clear on this point: The PMR cannot be given the risk interpretation that Phillips *et al.* would like:

> Note that the PMR is not a rate, since the denominator is derived from deaths and not from the population at risk. [The PMR] answers the question, 'What proportion of deaths is attributable to disease X?' In contrast, a cause-specific death rate answers the question, 'What is the risk of death from disease X for members of a population?' (Mausner and Kramer, 1985: 99)

In fact, correlations between gambling and suicide PMRs have another interpretation, and Mausner and Kramer (1985) — the source cited by Phillips *et al.* — are clear on that point:

> From the viewpoint of public health, the PMR is useful because it permits estimation of the proportion of lives to be saved by eradication or reduction of a given cause of death. On the other hand, PMRs can be misleading. Because the denominator refers to total deaths, its magnitude depends on the number of deaths from other causes besides the condition under consideration. (Mausner and Kramer, 1985: 99-100)

The misuse of PMRs can be illustrated with a simple example. Suppose that suicide and all other deaths in populations A and B are distributed as the following:

| | **A** | **B** |
|---|---|---|
| **Population at Risk** | **100,000** | **100,000** |
| **Suicides** | **10** | **10** |
| **All Deaths** | **900** | **900** |
| | | |
| **SSMR (suicide rate)** | **.0001** | **.0001** |
| **PMR** | **.0111** | **.0250** |

With this distribution, populations A and B have not only the same number of suicides (10) but, more important, the same suicide rates (10 per 100,000). Yet their suicide PMRs are very different. In this case, as in any other, it is a serious error to interpret differences in PMRs — gaming *vs.* nongaming communities, *e.g.* — or changes in PMRs — before *vs.* after, *e.g.* — as differences or changes in risk.

In some cases, such as the above example, inappropriate use of the PMR may lend the reverse impression of real mortality risk. The reason for Population B's higher PMR for suicide is not its high suicide rate, but its lower risk of death from other causes. In a plausible reinterpretation, then, Phillips' finding of a higher suicide PMR in the three gaming cities could be cited as evidence that gambling reduces other types of death! We are not reinterpreting their finding this way, of course, but pointing out the limitations of a "closed," or "zero-sum," statistic (a ratio in which, by definition, one component's increase equals other components' decreases) such as the PMR in evaluating an "open," non-zero-sum issue such as a population's mortality risk.

Phillips *et al.* are concerned with the effects of gambling on suicide risk and acknowledge that the suicide-specific mortality rate (SSMR) is preferable to the "suicide level" (PMR) that they employed:

> "Suicide level" is measured here as adult suicides [as a proportion of] total adult deaths. A preferable measure, the suicide rate (i.e., adult suicides/number of adult out-of-state visitors), cannot be calculated because the denominator is unknown. (Phillips *et al*, 1997: 374)

We agree, then, that the only appropriate statistic for the purpose of evaluating risk is the SSMR or, as we will say, the suicide rate. The suicide rate controls for differences in population size.[2] Because Cook County, Ill., has a larger population than Clark County, Nev., for example, Cook County is expected to have more suicides. Dividing by the population at risk controls this confound, allowing comparisons on other dimensions of suicide risk. In practice, rates are multiplied by 100,000 to give whole numbers. We follow that convention.

The SSMR is defined simply as the ratio of suicides to the population at risk.[3] That is,

$$\textbf{SSMR} = \frac{\textbf{Suicide Deaths}}{\textbf{Population at Risk of Suicide}}$$

The SSMR can be interpreted, roughly, as the probability that an at-risk individual will commit suicide during the year. Had Phillips *et al*. found that the SSMR was higher in Atlantic City, Las Vegas and Reno than in nongaming areas, or that Atlantic City's SSMR rose after the introduction of casinos, we would have some confidence in their interpretation of these correlations. As we will show, reliable data do exist to estimate the visitor population to, and most certainly the resident population of, the cities in question and thus provide a denominator to calculate suicide rates.

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[2]Suicide totals in the rate numerator are available from the National Center for Health Statistics (1997), the same source used by Phillips *et al.* the population at risk totals in the rate denominator are available from the U.S. Bureau of the Census (1997). Since both data sources are consistently reported at the county level, we use counties as the lowest unit of analysis.

[3]For most diseases, the entire population is not at risk. In the case of suicide, for example, children under the age of 12 would not be at risk and, thus, would not appear in the denominator of the *SSMR*.

2. Control Groups and "Matching"

Control is the *sine qua non* of valid inference. To demonstrate that suicides rise after the onset of gambling, Phillips *et al*. computed PMRs for the periods before (1968-77) and after (1978-88) the introduction of casinos. Having demonstrated that Atlantic City's suicide level[4] rises after 1978, however, Phillips *et al*. must show that the rise is not part of some larger, natural phenomenon; if suicide levels are rising elsewhere, it is difficult to argue that the rise in Atlantic City is due to legalized gambling. The way to demonstrate that suicide levels are not rising elsewhere us to calculate pre- and post-1978 PMRs for a control group. Concerning suicides by Atlantic City residents, for example, obvious control groups might include

- Suicides by residents of other New Jersey communities
- Suicides by residents of other Mid-Atlantic and southern coastal communities

The core principle, of course, is that the control group should include communities that, except for the presence of legalized gambling, are *similar* to Atlantic City.

Finding suitable controls for residential suicides is relatively simple. Suicides by visitors are another matter, unfortunately. For suicides by visitors to Atlantic City, the ideal control would consist of a set of cities with the same number of visitors as Atlantic City but with no casinos. Unable to locate the annual tourism data that would be needed for this purpose, Phillips *et al*. devised a clever strategy for building a "matched" control group.

> To determine whether the elevated suicide levels of GS (Gambling Settings, *i.e.,* Atlantic City, Las Vegas, and Reno) are an artifact of sex, age, race, or state of residence, we corrected for these four variables as follows: For each visitor death in a GS, we randomly chose interstate travelers who matched the GS decedent by age, race, sex and state-of-residence, and did not die in their own state or in Nevada or New Jersey. This general procedure allows us to find *n* matched controls for each GS under study. (p. 374)

Then comparing PMRs for Atlantic City suicide cases with analogous PMRs for the matched control group of cases, Phillips *et al*. find that

> Before casinos were opened in Atlantic City, the observed number of suicides was not significantly higher than the expected number derived from matched controls (Table 1, p>.22). Thus, visitors to Atlantic City began to experience atypically high suicide levels only after the establishment of gaming. (p. 375)

While matching is a reasonable and well accepted method for building control groups, the logic of matching assumes that cases are matched on all risk variables. In that respect, the matching strategy used by Phillips *et al*. fails.

For interstate visitor suicides, the single most important risk-related variable must be the individual's propensity for interstate travel. To illustrate, suppose that two decedents, A and B, are alike in terms of age, race, sex and state of residence and that neither died in Nevada or New Jersey. If A and B differ in their propensities for interstate travel,

[4]Phillips *et al.* are very careful in their language. They do not claim that suicide "rates" are affected by gambling. Instead, they refer to suicide "levels." Referring to their work and to their findings, we use the same term.

they face different risks of interstate suicide. If A spends 30 days a year out of state, for example, while B spends only 15 days out of state, then *ceteris paribus,* A has twice the risk of dying out of state. Because Phillips *et al*. could not match cases on this most crucial risk variable, their matched control group does not meet the minimum requirements.

### 3. Miscellaneous Concerns

Misuse of PMRs and use of an inadequate control group are major flaws. In our opinion, these flaws explain the Phillips *et al*. finding. When the conventional risk statistic is used with a conventional control group, the gambling-suicide correlation vanishes. Nevertheless, we have several other concerns with the Phillips *et al*. design. None is as important as the misuse of PMRs or lack of control — those are *fatal* flaws — but each merits notice.

- Phillips *et al*. end their study in 1988. Several major gambling sites that opened between 1988 and 1995 could have been included with Atlantic City in the before/after analyses. If Atlantic City's suicide levels did indeed rise following the introduction of casinos, we would expect to see similar phenomena in other sites.[5]
- Phillips *et al*. analyze only *interstate* suicides. A decedent who lives in Philadelphia but dies in Atlantic City is counted as a visitor death; a decedent who lives in Camden, N.J., on the other hand, but dies in Atlantic City, is not counted.
- For many purposes, Phillips *et al*. use metropolitan statistical areas (MSAs) instead of counties. Not withstanding obvious problems of measurement, the definitions of MSAs change over time. This raises unnecessary questions about the validity of before/after comparisons. To avoid these questions, we use MSAs in cross-sectional analyses only.
- The statistical analyses used by Phillips *et al*. were not developed for longitudinal analyses. Failure to control for serial dependence in hypothesis tests will generally lead to biased confidence levels.

None of these concerns by itself poses a fatal threat to the validity of the gambling-suicide correlation. Their cumulative effect is significant, however.

## B. What "Causes" Suicide?

Although we find no evidence to support the Phillips *et al*. claim of "elevated suicide levels associated with legalized gambling," the cross-sectional and longitudinal variation in suicide rates across geographical units must have some explanation. What "causes" suicide? In fact, the causes of suicide have been systematically debated for more than a century. Of the many ways to organize the known facts about suicide, the most consistent bodies of theory explain suicide with and psychological and sociological theories (Stillion and McDowell 1996; Lester 1992). For our purposes, the differences between psychological and sociological theories are simple:

- Psychological theories of suicide explain the variance in individual risk, *i.e.*, why some people are more likely to commit suicide than others.
- Sociological theories of suicide explain the variance in risk across social, political or economic units, *i.e.*, why some states have higher suicide rates than others.

[5]There are several practical reasons for not using deaths occurring after 1988. We discuss this issue in Chapter II.

Although psychological and sociological theories have much in common and often use similar explanatory variables, our perspective (and the perspective of Phillips *et al*.) is largely sociological in the sense that we are trying to explain why some geographical areas have higher-than-average suicide rates.

Sociological theories of suicide are based on the classic pioneering study of suicide by Emile Durkheim (1897, 1951). In his *Le Suicide,* Durkheim found that suicide results from a kind of misfit between the individual and his/her society. Based on this structure, Durkheim postulated four types of suicide:

- ***Egoistic:*** When an individual is alienated from social life, social bonds are weak and so is the bond to life. Example: Single people have higher suicide rates than married people.
- ***Altruistic:*** When the individual's social bonds are too strong, he/she is at risk of suicide as sacrifice to presumed societal needs. This type of suicide is rare. Example: World War II *kamikaze* pilots.
- ***Anomic:*** When a society fails to regulate the activities of an individual, he/she suffers from an excess of individual freedom combined with low levels of connection to larger society. Example: Mass suicides among isolated cultists who are "out of synch" with larger society or in Western frontier environs where societal regulation is weak.
- ***Fatalistic:*** When an individual is over-controlled, suicide may be employed as an escape. Example: Suicides among prisoners.

Suicides in America are generally considered to be of egoistic (the individual is isolated from society) or anomic (society fails to regulate the individual) type. Durkheim's classifications, which have been refined but are still widely accepted by social scientists, argue that changes in society's suicide-promoting forces are the most effective means of reducing suicide.

The relevant sociological question is whether gambling settings create the conditions that promote suicide by (a) weakening the individual's bonds to society, or (b) weakening society's control over the individual. To critics, gambling environments may be thought of as allowing excessive individual freedom with little societal regulation, promoting isolation of the individual from societal norms and promoting self-destructive behaviors such as suicide. In particular, certain individuals may incur large monetary losses or large monetary gains, both of which serve to isolate the individual from society and its moderating influences, Durkheim's theories argue. If gambling serves to create a "boom and bust" economy characterized by sudden wealth and sudden depression across an entire community, society itself (like the individual) may become destabilized and less able to control its members. In this view, gambling is a "deviant" behavior at odds with social regulation, stability and control.

To defenders, gambling settings are tightly regulated by law and promote social integration through entertainment and recreation, connecting the individual to peer culture and reducing the social isolation that promotes suicide. Further, by improving local economies and providing jobs, gambling integrates individuals to their society through employment and to other social institutions through greater prosperity. Because communities adopt gaming as an economic stimulant, the state of the economy without gambling must also be considered. In this view, gambling is an integrative force improving social life, infusing economic health and opening up opportunities for more individuals to become integrated with larger communities through both work and play.

In contrast to sociological theories of suicide, psychological theories focus on the role of individual factors. Individual factors in suicide are too numerous to address in more than sketched form. The psychological theories we evaluate classify personal suicide risk according to biological (chemical), cognitive/humanistic (reasoned) and psychosocial/behavioral (learned) factors:

- ***Biological:*** The brain chemistry of certain individuals make them susceptible to depression and suicide.

- ***Cognitive/humanistic:*** Suicide results from an individual's "rational" assessment that his/her life is meaningless, leading to a state of hopelessness and belief that death is preferable.
- ***Psychosocial/behavioral:*** Suicide results from an individual's developmental failure to learn how to cope with setbacks seen as beyond his or her control, a state called "learned helplessness." This state results from the child's observation of people important to him/her (*i.e.*, parents) who themselves are unable to overcome adversity.

Psychological theories hold that treatment of the individual's chemical (genetic), reasoning or learned flaws to produce a better match between the individual and society is the best way to reduce suicide.

Critics of gambling might apply psychological theories to argue that gaming environments (a) stimulate the pleasure-seeking brain centers of individuals biologically predisposed to high-risk, addictive behavior; (b) promote rational belief that life is not worth continuing, especially after large losses; and (c) reinforce a sense of helplessness in individuals who view winning and losing at gambling as crucial events beyond their control. Defenders might argue that psychological risk factors are present in a relatively small number of individuals whose vulnerability to a wide variety of society's stimulants — work, driving, eating, etc. — is best handled by treatment of individual biochemical imbalances, faulty reasoning, and/or poor means of coping with adversity rather than by banning every conceivable activity enjoyed by large numbers of low-risk people that might provoke risky behavior in a few.

The theoretical impact of gambling, then, depends on whether it is seen as reasonably fitting into, or radically deviating from, a community's other institutions. In the first case, gambling would be seen as presenting no unreasonable risks beyond those other normal pastimes society presents; in the second, gambling would be seen as provoking unacceptably high risks due to its departure from accepted norms. While this study cannot answer the political or philosophical question as to whether gambling is socially acceptable or deviant within a particular community, we can illuminate the important, practical matter of whether more suicides than would be expected do in fact coincide with gambling's presence or introduction. If significantly more suicides coincide with gambling than expected from the controlled evaluation of similar nongaming settings, the argument that gambling presents a de facto risk beyond those society normally accepts would be supported. If no significant elevation in suicide rates associated with gaming settings is found, the conclusion that gambling is a normative behavior (at least with respect to suicide and its larger social implications) would be indicated.

# II. METHODOLOGY

In this chapter, we detail the data, models and methods used in our analyses. Our purpose is to provide enough information so that our analyses can be replicated. Since our analyses and findings are substantially different from those of Phillips *et al.*, we summarize major differences at several points. Readers who are uninterested in the technical details of this study may skip to Chapter III. The data sources used by us and by Phillips *et al*. are outlined in Table II. The only major data source used by Phillips *et al*. are the Mortality Detail Files, 1968-88. As described below, these data consist of death certificates for all persons who died in a year in the United States. We use these data for the numerators of suicide rates; rate denominators were collected from the several sources listed. Since Phillips *et al*. did not use suicide rates, they had no need for the other data sources. Nevertheless, a description of each data source is required for replication. We begin the description with the Mortality Detail Files.

TABLE II - COMPARISON OF DATA AND SOURCES

| | **McCleary *et al.*** | **Phillips *et al.*** |
|---|---|---|
| **Deaths** | **Mortality Detail, 1968-95** | **Mortality Detail, 1968-88** |
| **Populations** | **U. S. Bureau of the Census** | **No data used** |
| **Visitors** | **American Travel Survey** | **No data used** |
| **Gaming Locations** | **Harrah's Entertainment, Inc.** | **Atlantic, Clark, Washoe counties** |

A. The Mortality Detail Files

The mortality data used for this study was taken from the Mortality Detail Files, 1968-95, recorded by the U.S. Department of Health and Human Services: Public Health Service, Center for Disease Control and Prevention, National Center for Health Statistics. The Mortality Detail records provided by the National Center for Health Statistics are the standard files used for mortality research in the United States. Mortality Detail data are limited to deaths within the United States, whether to citizens, legal residents or others. The occurrences of death to U.S. citizens outside the United States are therefore not reported in the Mortality Detail.

Within the Mortality Detail, each reported death is recorded as an individual case. At the individual level, all of the above variables are recorded, when available. The variables taken from the Mortality Detail and used for this study are listed in Table IIA. The age at death codes were recorded as the last complete year, with additional codes for less than one year complete. Race codes were changed over the period studied to reflect increasing numbers of discrete race classifications. When several races were reported, the first-listed was taken as definitive, except for white-nonwhite, combinations, where the first-listed nonwhite race was taken as definitive.

TABLE IIA - VARIABLES INCLUDED IN THE MORTALITY DETAIL FILES

| | |
|---|---|
| **General** | **Data Year**<br>**Resident Status** |
| **Occurrence** | **State**<br>**County** |
| **Residence** | **State**<br>**County**<br>**MSA** |
| **Decedent** | **Sex**<br>**Age at Death**<br>**Race**<br>**Autopsy Performed** |
| **Underlying Cause** | **International Classification of Disease, 7th-9th Revisions** |

1. Reporting Units

The state and county codes for occurrence, and residence variables utilized National Center for Health Statistics state/county codes and FIPS state/county codes, when necessary, for standardization purposes. Although National Center for Health Statistics codes may have changed with updates to county listing, these changes were integrated and standardized for the years observed.

Phillips *et al*. used metropolitan areas as the unit of analysis. We use both counties and metropolitan areas. The advantages of counties (vs. metropolitan areas) include stable boundaries and reporting consistency. Whereas metropolitan area boundaries may change from year to year, county boundaries are relatively stable. And since deaths are recorded by county coroners (or medical examiners) throughout the United States, suicide definitions are relatively constant within each county. The advantages of metropolitan areas (vs. counties) include the availability of data on economies and populations that are not available at the county level.

2. Cause of Death

The codes for cause of death in the mortality detail file are drawn from the International Classification of Disease (ICD), eighth edition, adapted for the United States (ICPSR 7632, Vol. I, 1968-1978). This classification codes 999 causes of death, plus 200 external causes. For the purposes of this study, the International Classification of Disease-34 codes was more commonly used. These codes simply categorize the ICDA into a more manageable variable. Within the 34 code classifications, suicide (code 350) falls into the external cause category, codes E950-E959 of the ICDA codes.

3. Visitor Status

The Mortality Detail Files include data on resident status. The codes for resident status are as follows: 1) county resident; 2) state resident; 3) out-of-state resident; and 4) non-U.S. resident. The conventions of “resident,” “intrastate resident,” “interstate resident” and “foreigner” were used.

4. Idiosyncrasies

Analyses of mortality data must account for at least three idiosyncrasies: (1) The 1972 50 percent sample anomaly; (2) the 1989 Privacy Act; and (3) place of death reporting conventions. In detail:

- In 1972, due to federal budgetary cutbacks, the Mortal Detail File was based on a 50 percent sample of reported deaths. To accommodate this one-year change, 1972 death totals were doubled.
- In 1989, the National Center for Health Statistics adopted a new policy to protect the privacy of the individuals and institutions with information contained within the vital event files. After 1988, the day of death and date of birth of the decedent are not reported, and geographic details are restricted. The latter change adversely affects the geographic analysis by only reporting deaths in counties, cities and metropolitan areas with populations greater than 100,000 based on the current census. Data reported to the National Center for Health Statistics by the individual states is therefore aggregated at the state level for these areas.
- The reported county and state of occurrence recorded in the Mortality Detail reflects the county in which the decedent died, not which county the external cause of death initially occurred in. In gaming areas or counties with regional trauma centers, a crossing of county boundaries may occur in the transportation of a patient. The actual death may occur in the county in which a regional trauma center (or hospital) lies, but not necessarily where the suicide incident occurred. The bias caused by a catchment area may be compensated for by examining other measures of mortality for the same areas (*i.e.*, homicides, auto accidents, etc.) and comparing rates.

Our analyses addressed all of these idiosyncrasies. None of the adjustments that we used could explain the dramatic differences between our findings and the findings of Phillips *et al.*

B. County Population Estimates

County population totals were taken from estimates published by the Population Estimates Program, Population Division, U.S. Bureau of the Census.[6] The intercensal estimation algorithm for the 1970s is described in Current Population Reports, Series P25-957. The algorithm for the 1980s is described in Current Population Reports, Series P25-1106. Intercensal estimates on census counts with the latest corrections available at the time of production. County estimates are rounded to the nearest 100. Population totals will not necessarily match the totals used by vital statistics for national population estimates. Estimates from the two sources are quite close, however, especially for the counties used in our analyses.

Since comparable population estimates are not available for 1968-69, these two years were excluded from the time series analyses reported in Chapter III. After 1990, the county population estimates are available by five-year age categories. One would ideally want to use age-specific rates for analysis. Given the computational costs of these data, however, we used crude population totals.

C. The *American Travel Survey*

Calculation of visitor suicide rates requires both the number of visitor suicides (in the numerator) and the number of visitor-years (in the denominator). Data for the numerator are available from the Mortality Detail Files, as described above. Data for the denominator, namely the number of visitors to each geographical area comes from the *American Travel Survey.* Conducted by the Census Bureau and the Bureau of Transportation Statistics in 1995 and

[6]The data were downloaded from www.census.gov/population/estimates/county.

1996, the *American Travel Survey* is the most complete and authoritative source of estimates of the numbers of visitors to U.S. locations.

The *American Travel Survey* interviewed a probability sample of 80,000 U.S. persons. Each person was asked to describe trips of 100 or more miles; questions included the dates, points of origin and destination, purpose of travel, modes of travel, number of travelers in the party, length of trips, and lodging choices.[7] The survey's person-trip files were used to estimate the number of visitors to each SMSA. These estimates were then used as the denominators of the visitor suicide rates analyzed in Chapter IV.

Each person-trip in the survey has a sampling weight to reflect the probability of selection and other factors such as interview refusals and trip under-reporting (see Appendix C of the *American Travel Survey* for more detailed discussions of methods). These weights were used in all calculations.

### D. Gaming Areas

Data on the locations of gaming establishments (casinos) was provided by Harrah's Entertainment, Inc. through an agreement with the American Gaming Association, Department of Research. In addition to location (congressional district, city, county, ZIP code and phone/fax number) the comprehensive list of gaming establishments included such variables as owner, number of employees, gaming square footage, number of electronic games, tables, and hotel rooms and other facilities. The list included only state licensed gaming establishments were used for analysis. The sample included only casino or cardhouse type establishments, and did not include racetracks or off-track wagering of any kind. Specifically, resort destinations were the primary unit of analysis.

All of the gaming establishments were contacted by phone for verification purposes. In addition to verifying existing data, other data were collected, including 1) verification that the establishment is in operation; 2) opening date; and 3) tribal gaming establishments. Gaming establishments that could not be contacted were considered to be closed. This was verified by telephone information operators when possible.

### E. Risk and Rates

Whereas Phillips *et al*. use PMRs, we use suicide rates. In principle, a mortality rate is defined as the ratio of deaths to the population at risk. For resident suicides, which are analyzed in Chapter III, the numerator of the suicide rate is defined as the number of suicides by county (or metropolitan area) residents that occur in the county plus the number of suicides by county (or metropolitan area) residents that occur elsewhere; the denominator is the total population of the county (or metropolitan area). For or visitor suicides, which are analyzed in Chapter IV, the numerator of the suicide rate is defined as the number of suicides by visitors to the county (or metropolitan area); the denominator is the total number of trips to the county (or metropolitan area).

[7] Micro level data, at the person-trip or household-trip level, can be downloaded from the Bureau of Transportation Statistics at www.bts.gov/programs/ats.

# III. RESIDENT SUICIDES

Phillips *et al.* (1997) report two distinct but related findings. First, analyzing a subset of *resident* suicides, they conclude that residents of three gaming areas — Las Vegas, Reno and Atlantic City — have higher-than-expected suicide risks. Second, analyzing a subset of *interstate* visitor suicides, they conclude that visitors to these three gaming areas have higher-than-expected suicide risks. This chapter examines the finding that residents of gaming areas have higher suicide risks. Toward that we present the results of two analyses.

- Cross-sectional analyses of 1990 resident suicide rates for 148 metropolitan areas.
- Time series analyses of resident suicide rates for five counties where gambling was legalized during 1978-95.

The cross-sectional analyses demonstrate the effects of population growth and density, unemployment, and regional differences on resident-suicide rates. The presence or absence of casino gambling explains little cross-sectional variance, however. The time series analyses support this view. In the five counties where gambling was legalized during 1978-95, including Atlantic City, before/after differences are not statistically significant and, moreover, are no larger than the differences from control counties. Resident suicide rates neither rise nor fall when gambling is legalized. In sum, both time series and cross-sectional analyses demonstrate that the suicide *risk* associated with living in a gaming area — including Atlantic City, Las Vegas and Reno — is neither higher nor lower than the risk of living in nongaming areas.

## A. Cross-Sectional Analyses

Analyzing PMRs for metropolitan areas, Phillips *et al.* conclude that "gambling or some factor closely associated with gambling settings" elevates the risk of suicide for residents of those areas. In Chapters I and II, we noted that PMRs are not suited to inferences of the sort intended by Phillips *et al.;* suicide *rates* are required for that purpose. When suicide rates are computed for U.S. metropolitan areas, Las Vegas and Reno are still among the highest in the United States. Atlantic City's resident suicide rate is among the lowest in the United States, however, and between the two extremes we see gaming areas with low rates and nongaming areas with high rates. Overall, the evidence is more ambiguous than Phillips *et al.* admit.

Table IIIA1 lists the 50 metropolitan areas (out of 148) with the highest crude resident suicide rates in 1990.[8] Las Vegas and Reno are first and fourth on the list with resident suicide rates of 20.98 and 19.22 per 100,000 residents. But Salt Lake City, which has no legal gambling whatsoever, is ninth on the list, with a rate of 17.26, and Atlantic City fails to make the list. Its rate of 9.09 deaths per 100,000 residents ranks it 122nd among the metropolitan areas.

[8]We use 1990 because it was a census year. These metropolitan areas are the areas used in the *1995 American Travel Survey,* which we analyze in the next chapter. The rates in Table IIIA are "crude" in the sense that they are not adjusted for age or other differences across the metropolitan areas.

TABLE IIIA1 - METROPOLITAN AREA RESIDENT SUICIDE RATES, 1990

| | | | | | |
|---|---|---|---|---|---|
| 1 | Las Vegas, NV* | 20.98 | 26 | Springfield, MO | 15.15 |
| 2 | Daytona Beach, FL | 19.55 | 27 | Richmond, VA | 14.90 |
| 3 | Melbourne, FL | 19.30 | 28 | New Orleans, LA | 14.86 |
| 4 | Reno, NV* | 19.22 | 29 | Omaha, NE | 14.84 |
| 5 | Salem, OR | 18.35 | 30 | Ft. Myers, FL | 14.63 |
| 6 | Tucson, AZ | 17.84 | 31 | Santa Barbara, CA | 14.59 |
| 7 | Vallejo-Fairfield-Napa, CA | 17.29 | 32 | Lansing, MI | 14.55 |
| 8 | Tampa, FL | 17.26 | 33 | San Francisco, CA* | 14.53 |
| 9 | Salt Lake City, UT | 17.26 | 34 | Oklahoma City, OK | 14.49 |
| 10 | Phoenix, AZ* | 17.24 | 35 | Stockton, CA | 14.35 |
| 11 | Denver, CO | 17.13 | 36 | Gary, IN | 14.21 |
| 12 | Johnson City, TN | 16.74 | 37 | Birmingham, AL | 14.17 |
| 13 | Bridgeport, CT | 16.67 | 38 | Louisville, KY | 14.01 |
| 14 | West Palm Beach, FL | 16.67 | 39 | Knoxville, TN | 13.99 |
| 15 | Columbia, SC | 16.34 | 40 | Scranton, PA | 13.93 |
| 16 | Macon, GA | 16.15 | 41 | San Diego, CA | 13.81 |
| 17 | Allentown, PA | 16.13 | 42 | Memphis, TN | 13.80 |
| 18 | Ft. Lauderdale, FL | 15.92 | 43 | Des Moines, IA | 13.74 |
| 19 | Colorado Springs, CO | 15.87 | 44 | Miami, FL* | 13.68 |
| 20 | Sacramento, CA | 15.82 | 45 | Bakersfield, CA | 13.60 |
| 21 | Tacoma, WA | 15.70 | 46 | Beaumont, TX | 13.57 |
| 22 | Mobile, AL | 15.30 | 47 | Charleston, WV* | 13.55 |
| 23 | York, PA | 15.29 | 48 | Seattle, WA | 13.43 |
| 24 | Albuquerque, NM | 15.28 | 49 | Eugene, OR | 13.43 |
| 25 | Augusta, GA | 15.18 | 50 | Worcester, MA | 13.39 |
| | | | 122 | Atlantic City, NJ* | 9.09 |

* Casino of any type present in 1990

Although Las Vegas and Reno have relatively high resident suicide rates, inconsistent cases like Atlantic City and Salt Lake City cast doubt on the Phillips *et al*. claim. Nevertheless, if not gambling, then what causes the relatively high rates in Las Vegas and Reno? The answer lies in the patterns of similarity among the 50 high-rate metropolitan areas listed in Table IIIA1. For example, seven of the top 20 areas are in the Rocky Mountain region, which, historically, has had higher-than-average resident suicide rates. The rates for Las Vegas and Reno are of the same rough magnitude as the rates for Tucson, Salt Lake City, Phoenix, Denver and Colorado Springs.

TABLE IIIA2 - RESIDENT SUICIDE RATES BY STATE, 1990

| State | Mean | S.D. | State | Mean | S.D. |
|---|---|---|---|---|---|
| Nevada | 23.98 | 2.87 | Delaware | 11.98 | 1.92 |
| Wyoming | 18.21 | 2.58 | Louisiana | 11.90 | 1.88 |
| New Mexico | 17.70 | 2.80 | Kansas | 11.86 | 1.37 |
| Montana | 17.49 | 3.66 | South Dakota | 11.78 | 2.24 |
| Arizona | 17.34 | 2.24 | Arkansas | 11.72 | 1.98 |
| Colorado | 16.99 | 1.81 | Michigan | 11.70 | 1.42 |
| Florida | 15.56 | 2.11 | Indiana | 11.49 | 1.59 |
| Idaho | 15.37 | 2.57 | Ohio | 11.36 | 1.66 |
| Oregon | 15.20 | 1.87 | Iowa | 11.32 | 1.57 |
| California | 14.73 | 2.97 | Pennsylvania | 11.18 | 1.49 |
| Vermont | 14.66 | 2.37 | South Carolina | 11.12 | 1.65 |
| Washington | 13.92 | 1.47 | Alabama | 11.03 | 1.79 |
| Oklahoma | 13.28 | 1.96 | North Dakota | 10.89 | 1.79 |
| Virginia | 13.16 | 1.59 | Minnesota | 10.87 | 1.47 |
| Utah | 13.11 | 1.89 | Nebraska | 10.71 | 1.73 |
| Maine | 13.08 | 1.60 | Maryland | 10.56 | 1.17 |
| Kentucky | 12.78 | 1.48 | Hawaii | 10.36 | 1.72 |
| Tennessee | 12.63 | 1.50 | Mississippi | 10.10 | 1.87 |
| Georgia | 12.52 | 1.57 | Illinois | 9.24 | 1.34 |
| Missouri | 12.48 | 1.77 | Connecticut | 9.16 | 1.09 |
| New Hampshire | 12.27 | 1.74 | Rhode Island | 9.96 | 2.22 |
| West Virginia | 12.24 | 2.01 | District of Columbia | 8.76 | 2.37 |
| North Carolina | 12.14 | 1.43 | | | |
| Wisconsin | 12.10 | 1.40 | Massachusetts | 8.58 | 1.06 |
| Texas | 12.01 | 1.62 | New York | 8.11 | 1.27 |
| | | | New Jersey | 7.26 | 0.87 |

The regional effect is apparent in the statewide resident suicide rates reported in Table IIIA2. Nevada's rate of 23.98 per 100,000 residents is the highest of 49 states and District of Columbia. (Alaska is excluded because of idiosyncrasies in its data collection.) But the neighboring mountain states of Wyoming, New Mexico, Montana, Arizona and Colorado have nearly comparable resident suicide rates.[9] Finally, despite the presence of a large legal gambling site, New Jersey's rate of 7.26 per 100,000 residents is the lowest of the 49 states. Suicide rates can also rise with rapid population growth and/or decay. Of 148 metropolitan areas, Las Vegas and Reno had the third- and 20th-highest 1980-90 growth rates, respectively. Several Sun Belt areas had similarly high growth rates, while several Rust Belt areas — Gary and Scranton — had high rates of decay. At the statewide level, Florida's relatively high rate can be attributed to rapid growth.

[9]Nevada's annual standard deviation of 2.87 implies that, in the long run, its rate will dip below 20.00 once every five years.

Regional effects and population change can explain the relatively high resident suicide rates in Las Vegas and Reno. Other factors, including age, race and sex compositions across the areas can also be used to explain the pattern. In any event, the exceptional cases — Salt Lake City and Atlantic City, for example — as well as the absence of a strong correlation between legalized gambling and resident suicides, render the Phillips *et al*. finding implausible.

B. Time Series Analyses

Cross-sectional analyses have obvious limitations. There is little consensus on the appropriateness of explanatory variables, for example, or on the plausibility of any interpretation. In light of these limitations, we address the question with a longitudinal design. In counties where gambling was legalized during 1970-95, the impact on suicide risk can be estimated from residential suicide time series. In this design, rates before and after legalization are compared. In Atlantic County, N.J., for example, the breakdown of resident suicides for the eight years before (1970-77) and the 18 years after (1978-95) legalization, shows an increase from 8.15 to 9.35 per 100,000 residents. Specifically,

| | 1970-77 | 1978-95 |
|---|---|---|
| **Suicides Occurring in Atlantic County** | **104** | **321** |
| **Suicides Occurring Elsewhere** | **17** | **36** |
| **Per 100,000 Population at Risk** | **8.15** | **9.35** |

Since the rate increased after 1978, one might conclude that casino gambling "causes" suicide — or at least, aggravates an existing community problem. But to draw a valid conclusion, the before/after difference in Atlantic County must pass two tests.

- ***Statistical Significance:*** The increase in Atlantic County must be larger than what could occur by chance alone.
- ***Internal Validity:*** The increase in Atlantic County cannot be part of a larger phenomenon that affects gaming and non-gaming counties alike.

Statistical significance is tested by comparing the before/after difference in Atlantic County to a theoretical distribution of differences based on Atlantic County's history. If the post-1978 is not larger than 95 percent of the expected differences, we conclude that the post-1978 increase is a statistical "fluke."

If Atlantic County's post-1978 increase passes the statistical significance test, on the other hand, we must demonstrate that the increase is *not* due to some broader phenomenon. The test of internal validity consists of analyzing suicide rate time series for a set of *control* counties that did not implement casino gaming in 1978. If post-1978 increases are found in the set of control counties, Atlantic County's post-1978 increase cannot be due to the arrival of casinos.

TABLE IIIB1 - CONTROL COUNTIES

| | | Population | | Suicide Rate | |
|---|---|---|---|---|---|
| | | **1970** | **1990** | **1970** | **1990** |
| **Nongaming** | **Honolulu, HI** | **630,528** | **32.9%** | **9.5** | **10.7** |
| | **Davis, UT** | **99,028** | **90.08%** | **11.1** | **11.6** |
| | **Salt Lake, UT** | **458,607** | **59.0%** | **17.7** | **18.1** |
| | **Utah, UT** | **137,776** | **92.1%** | **9.4** | **9.4** |
| | **Weber, UT** | **126,278** | **25.7%** | **12.7** | **19.5** |
| **Gaming** | **Clark, NV** | **273,288** | **176.1%** | **21.9** | **23.7** |
| | **Washoe, NV** | **121,068** | **111.7%** | **24.8** | **19.1** |

Although internal validity tests seem simple in theory, in practice, it is sometimes difficult to find suitable *control* counties. Table IIIB1 describes seven *theoretically* important counties. Five of the seven (Honolulu County, Hawaii; Davis, Salt Lake and Weber counties, Utah) are in states that have never had casino gaming; the two other counties (Clark and Washoe counties, Nev.) are in a state that has had casino gaming continuously since 1931.[10] In either case, whether in a gaming or a nongaming state, we expect to see no post-1978 increase in suicide rates in these counties because there was no change in 1978. They are *controls* in that sense.

But like all quasi-experimental controls, these seven counties are problematic in many respects. All seven are in the West, for example, and all seven have experienced rapid population growth from 1970 to 1990. Since a control county must be "similar" to the county under analysis — which we will call the "test" county — these seven counties may be inadequate for eastern, southern, or midwestern counties, or for counties that experienced slow population growth or even decline. To capture this aspect of control, we will also use counties in the same state or region as the test county.

The problem of finding suitable control counties is solved, to some extent, by using a large number of controls. The problem of finding suitable test counties is not so easily solved. Phillips *et al*. used only one test county. In Atlantic County, N.J., casino gambling was legalized abruptly in 1978; casinos sprung up immediately, giving a sharp before/after contrast. In most cases, however, casinos were not opened until 1994 or 1995, leaving little or no post-intervention time; 1995 is the latest year for the Mortality Detail Files. In a few counties where casinos opened in the early 1990s, moreover, they were often opened gradually, in a desultory manner, after legalization, blurring the before/after contrast. Nevertheless, we have found five test cases that appear to provide a good test of the gambling-suicide hypothesis. These test cases are described in Table IIIB2 and in the following text.[11]

[10]These seven counties are the only counties in Hawaii, Utah and Nevada that are large enough to be reported separately in the U.S. Mortality Detail Files; after 1988, all other counties in Hawaii, Utah and Nevada are aggregated into "other."

[11]An appendix to this chapter includes maps showing the locations of test and control counties, lists of the casinos in each test county, and technical details of the statistical analyses.

TABLE IIIB2 - TEST COUNTIES

| | | Population | | Suicide Rate | |
|---|---|---|---|---|---|
| | **Onset Date** | **1970** | **1990** | **1970** | **1990** |
| **Atlantic, NJ** | **1978** | **175,043** | **28.6%** | **8.00** | **7.55** |
| **Lawrence, SD** | **1989** | **17,453** | **18.6** | **17.59** | **14.50** |
| **Douglas-Gilpin, CO** | **1991** | **9,679** | **568.2%** | **41.33** | **10.82** |
| **Harrison, MS** | **1992** | **134,582** | **18.5%** | **7.43** | **12.11** |
| **Will, IL** | **1992** | **247,825** | **55.7%** | **8.88** | **11.97** |

***Atlantic County, N.J.:*** Located in southeastern New Jersey, Atlantic County's 1990 population was 224,327, comprised of 77 percent white, 17 percent black, and 6 percent other racial groups. The county seat is Atlantic City. Atlantic County's economy is based almost entirely on tourism (resort, convention center, casinos), although it is supplemented by the shipping of seafood. With the increase in air travel to other resorts following World War II, Atlantic City experienced a continuous and serious decline in tourism. The legalization of gaming and casinos in the late 1970s stimulated the economy of the surrounding area and provided much-needed jobs.

***Lawrence County, S.D.:*** Lawrence County, located in western South Dakota, had a 1990 population of 20,655, consisting of 96 percent white, 3 percent American Indian, and 1 percent black and other racial groups. The seat of Lawrence County, Deadwood, is a commercial and processing center for the surrounding mining, lumbering and livestock-raising area. Because of Deadwood's location in the center of the Black Hills, and its proximity to Mount Rushmore, tourism has become an important part of the local economy. Of the 25 casinos located in Deadwood City, all were open for business between November 1989 and July 1996.

***Gilpin and Douglas counties, Colo.:*** Douglas County is located just to the southeast of Denver. Castle Rock, the county seat, is the largest city within Douglas County. Douglas County is home to a national forest and two state parks. Douglas County's 1990 population of 60,391 is 97 percent white, 1 percent black and 2 percent other racial groups. Gilpin County is a neighboring county. In 1990, the total population of Gilpin County was 3,070, composed of 97 percent white, 1 percent American Indian, less than 1 percent black and less than 2 percent other racial groups. The Cripple Creek area contains all Douglas County's 25 gaming establishments. All 25, including one tribal casino, were established after January 1991. Of the 32 gaming establishments operating in Gilpin County, only the Black Hawk Station (which opened in 1982) was open prior to January 1991. These casinos are split between the areas of Central City and Black Hawk.

***Harrison County, Miss.:*** The 1990 population of Harrison County was 165,365, composed of 77 percent white, 19 percent black, 3 percent Asian or Pacific Islander, and less than 1 percent other racial groups. Gulfport, the county seat and a U.S. port of entry, is located in the southeastern corner of the state on the Gulf of Mexico. Gulfport's economy includes seafood canning and aluminum and steel fabricating. Because of the city's excellent beaches, as well as gaming, Gulfport has become a tourist mecca. Casino gambling was introduced to the Mississippi Gulf Coast in 1978, and Harrison County is the hub of this activity. Twelve casinos have opened in Harrison County since 1992. Ten are in Biloxi and two are in Gulfport.

***Will County, Ill.:*** Will County is located in northeastern Illinois, south of Cook County. The county seat, Joliet, is located approximately 40 miles southwest of Chicago on the Des Plaines River. The 1990 population of Will County was 357,313, composed of 85 percent white, 11 percent black, 1 percent Asian or Pacific Islander, and less than 4 percent other racial groups. Will County's two gaming establishments, the Empress Casino and Harrah's Joliet Casino, were opened in June 1992 and May 1993, respectively.

TABLE IIIB3 - BEFORE/AFTER STATISTICS FOR ATLANTIC COUNTY, NJ

| | Before | After | Change | t-Ratio | p(t) |
|---|---|---|---|---|---|
| **Atlantic, NJ** | **8.62** | **9.28** | **+.659** | **.75** | **.773** |
| **Lawrence, SD** | **19.25** | **9.52** | **-9.726** | **-2.67** | **.004** |
| **Douglas-Gilpin, CO** | **18.59** | **14.19** | **-4.430** | **-1.20** | **.115** |
| **Harrison, MS** | **12.83** | **15.12** | **2.291** | **1.34** | **.910** |
| **Will, IL** | **9.64** | **8.22** | **-1.423** | **-1.00** | **.159** |

The five test counties were selected from a set of possible candidate counties on the basis of their potential for testing the null hypothesis that: resident suicide rates were unaffected by gambling legalization. In each test county, a burst of development followed legalization, effectively separating a time series of resident suicide rates into distinct pre- and post-legalization segments. This separating facilitates analysis with the methods described in McCleary and Hay (1978). The results of these analyses are summarized in Table IIIB3. The columns of Table IIIB3 can be interpreted as follows:

- The first column of Table IIIB3, labeled "Before," gives the resident suicide rate per 100,000 residents in the years prior to legalization. To illustrate, Atlantic County's resident suicide rate during 1970-77 was 8.62 per 100,000.
- The third column, labeled "Change," gives the estimated rise in the resident suicide rate in the years following legalization. For Atlantic County, the post-legalization period is 1978-95 and in that time, the resident suicide rate rose by .66 suicides per 100,000.
- The fourth column, labeled "t-Ratio," translates the estimated change into a standardized (Normal) statistic that can be compared across the set of counties. Atlantic County's .66 increase, for example, translates into an increase of .75 standard deviations.
- The fifth column, labeled "p(t)," gives the probability associated with the t-Ratio. For Atlantic County, under the null hypothesis, the t-Ratio of .75 has an associated probability of .773.

Only the fifth column of Table IIIB3 is relevant for statistical significance tests. The common null hypothesis assumes that the before/after change in each of the five test counties is a statistical "fluke," a result of simple chance. This hypothesis is rejected if the probability associated with the t-Ratio is smaller than .05; and having rejected the null hypothesis, we accept, albeit tentatively the alternative hypothesis that the change is due to the legalization of gambling. With this introduction, Table IIIB3 has a simple, consistent interpretation:

- In the aftermath of legalization, resident suicide rates rose in Atlantic and Harrison counties and fell in Lawrence, Douglas-Gilpin and Will counties.
- Since the probabilities associated with their t-Ratios are larger than .05, the post-legalization changes in Atlantic, Harrison, Douglas-Gilpin and Will counties are statistically insignificant. These changes lie within the bounds of sampling error.
- In Lawrence County, on the other hand, since the probability associated with the t-Ratio is smaller than .05, the null hypothesis is rejected. We conclude, albeit tentatively, that the estimated drop of 4.4 suicides per 100,000 residents, was due to the legalization of gambling.

Before the alternative hypothesis in Lawrence County can be fully accepted, the impact must be compared to the pattern of impacts in the control counties. Since Lawrence County's impact amounts to a post-legalization reduction in the resident suicide rate, however, internal validity is a moot point. The analyses summarized in Table IIIB3 are unambiguous in one important sense. The results lead to the unambiguous rejection of the claim by Phillips *et al.* *There is virtually no evidence to support their theory that residents of gaming areas — including Atlantic City, Las Vegas and Reno — face heightened risks of suicide.*

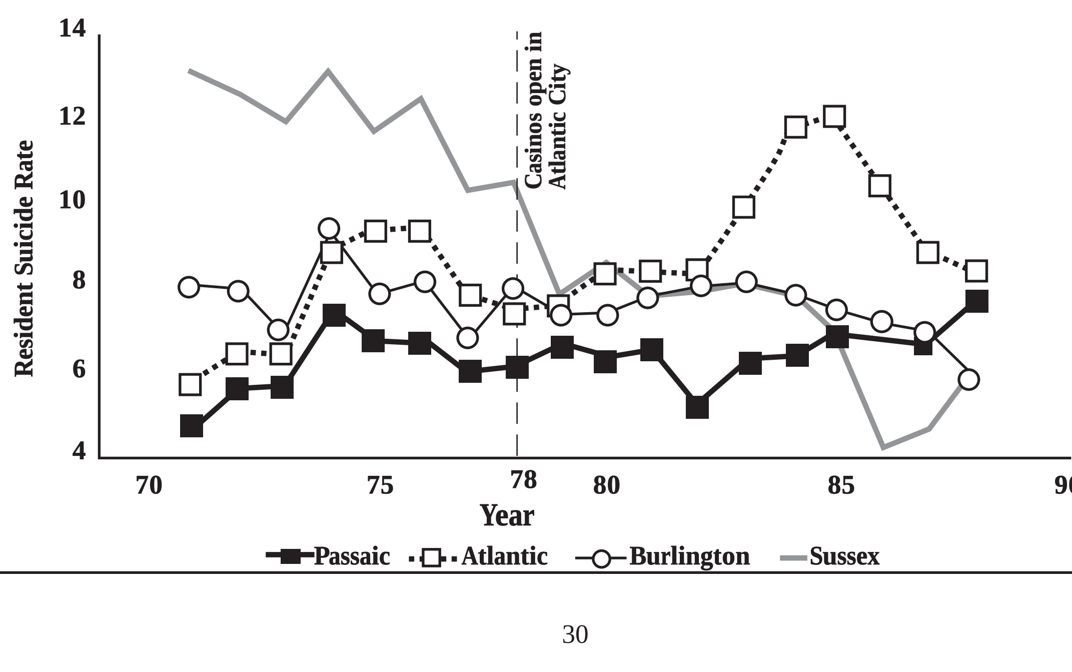
C. Conclusion

The figure below plots the annual resident suicide rates for four New Jersey counties before and after legalization of gambling in 1978. The Atlantic County series rises and falls in short cycles throughout its history. A short cycle in 1983-85 gives the visual impression that the resident suicide rate rose following legalization. In fact, as our analysis demonstrates, there is no consistent change in the series other than its natural pattern of drift. If legalization had the impact on resident suicide rates claimed by Phillips *et al*., one might expect to see an impact in Burlington County, which lies directly north of Atlantic City (and in the other neighboring counties, particularly Ocean, Cape May and Camden). But in fact, legalization appears to have no impact on Burlington County's series, and the same can be said of Ocean, Cape May and Camden counties.

Passaic and Sussex counties are as far from Atlantic County as it is possible to be and still be in New Jersey. Yet if one had to pick a county that "looked like" legalization had an impact, Sussex would be a good choice. If one had to pick a county where it "looked like" legalization had *no* effect, Passaic would be a good choice. In that sense, the control counties illustrate the range of behavior that is typical of New Jersey's annual resident suicide rates.

Given the consistent pattern of time series results, we have great confidence in our finding of no "elevated risk of suicide" for residents of gaming areas. The contrary claim by Phillips *et al.* rests entirely on their misuse of PMRs and on the fact that, of the 50 states, Nevada has the highest resident suicide rate. If the fallacy in this logic is not obvious, remember that on *any dimension* one state must be highest (and one must be lowest). Attributing a state's first-place (or last-place) standing to some attribute — Idaho potatoes, Wisconsin cheese, etc. — is a fallacy. Nevada's rates are similar to the rates of other states in the Rocky Mountain region. The fact that New Jersey has the lowest resident suicide rate of the 50 states argues against the Phillips *et al.* interpretation.

FOUR NEW JERSEY COUNTIES



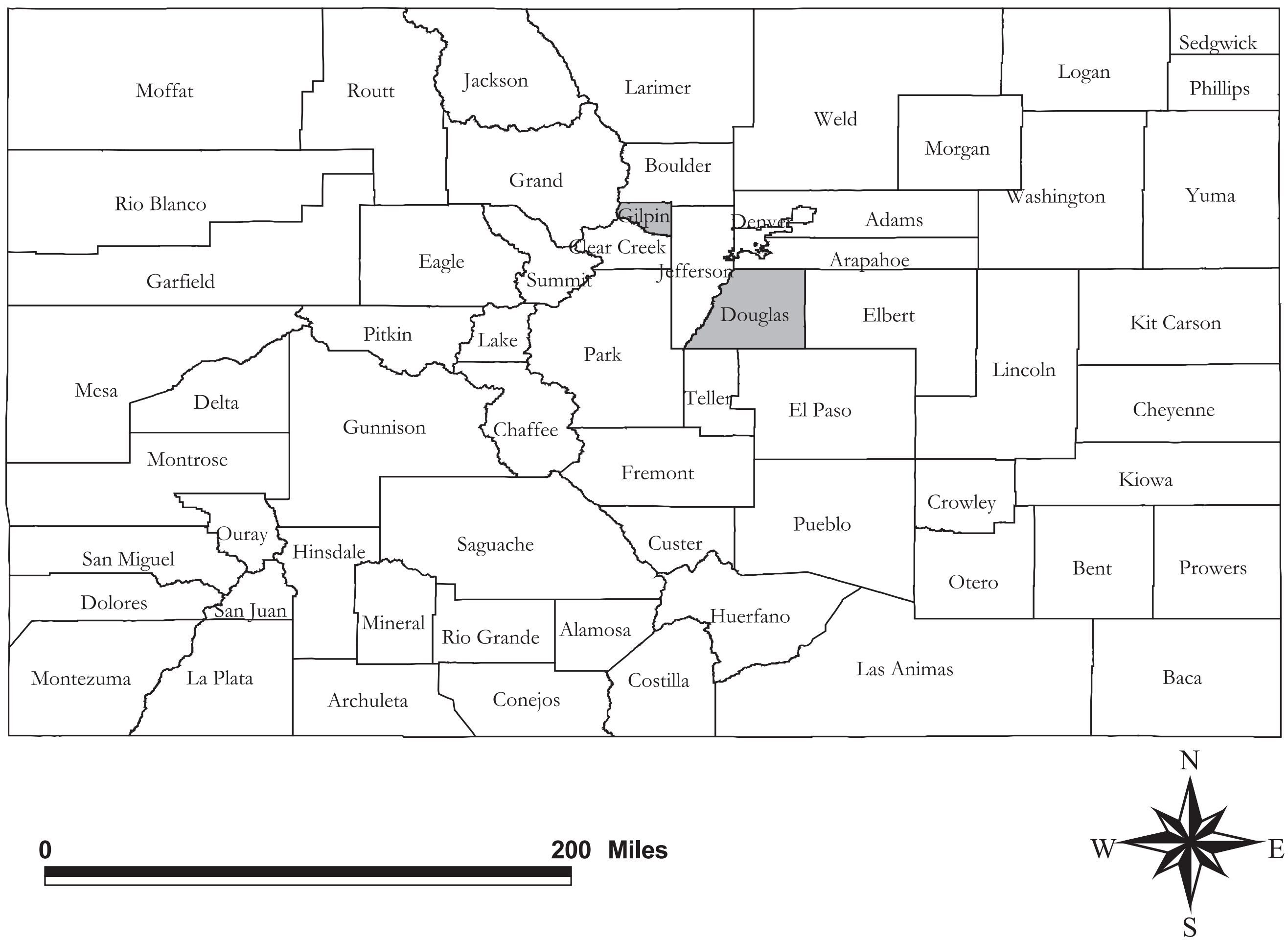
# APPENDIX TO CHAPTER III

MAPS - GAMBLING COUNTIES ARE IN GRAY*

TIME SERIES ESTIMATES - EFFECT ESTIMATES FOR GAMING, NONGAMING AND REGIONAL CONTROL COUNTIES

**Note: Gray areas indicate counties examined; gaming may also be legal in other counties or communities in the state.*

# Colorado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Routt
Jackson
Larimer
Weld
Logan
Sedgwick
Phillips
Morgan
Boulder
Grand
Rio Blanco
Gilpin
Denver
Adams
Washington
Yuma
Clear Creek
Arapahoe
Garfield
Eagle
Summit
Jefferson
Douglas
Elbert
Kit Carson
Pitkin
Lake
Park
Mesa
Delta
Lincoln
Teller
El Paso
Cheyenne
Gunnison
Chaffee
Montrose
Fremont
Kiowa
Crowley
Ouray
Pueblo
Custer
Saguache
San Miguel
Hinsdale
Bent
Prowers
Otero
Dolores
San Juan
Huerfano
Mineral
Alamosa
Rio Grande
Las Animas
Montezuma
La Plata
Costilla
Baca
Archuleta
Conejos
0
200 Miles
N
W
E
S

# Illinois

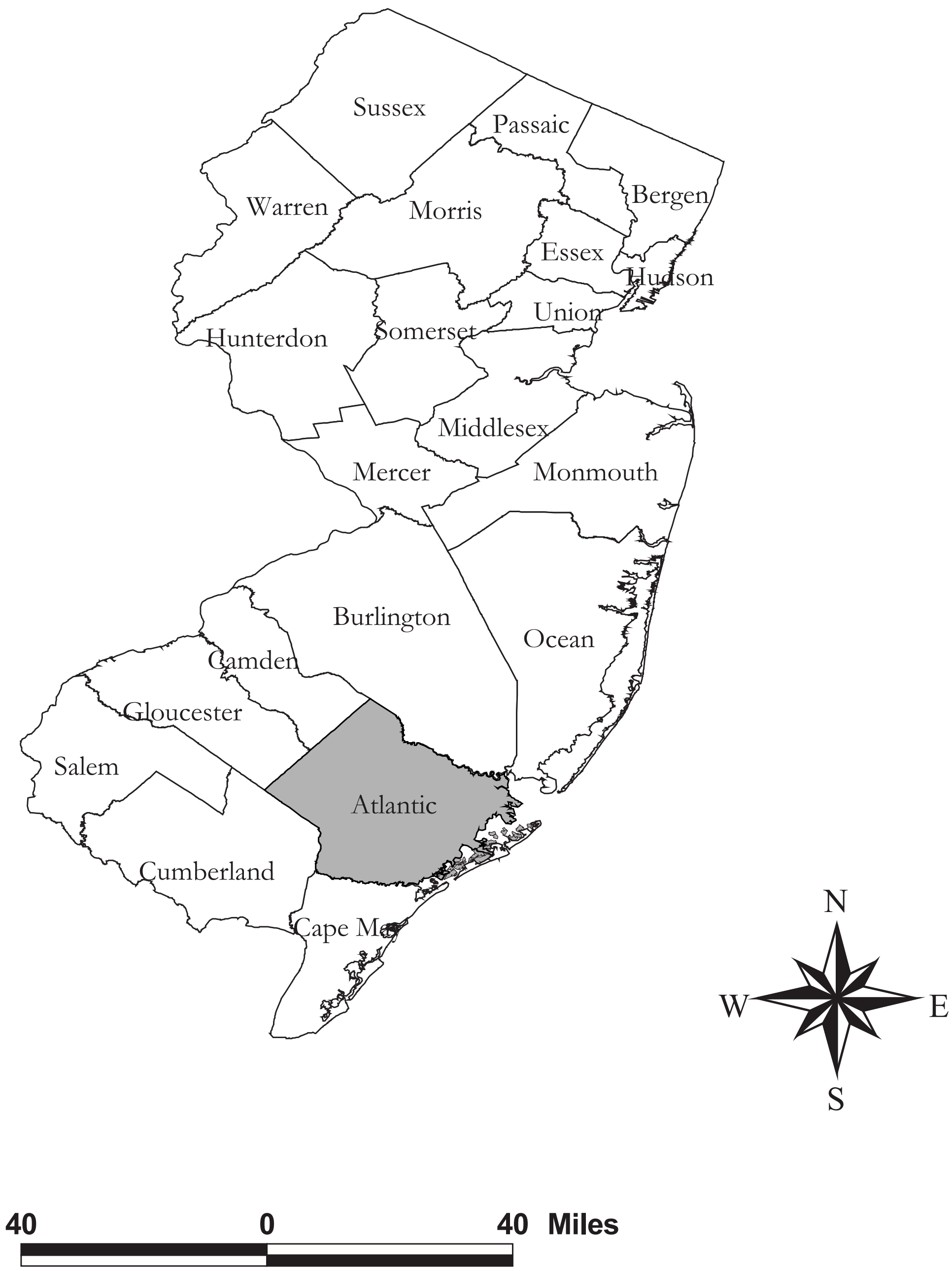

Jo Daviess
Stephenson
Winnebago
Boone
McHenry
Lake
Carroll
Ogle
De Kalb
Kane
Du Page
Cook
Whiteside
Lee
Kendall
Will
Rock Island
Henry
Bureau
Putnam
La Salle
Grundy
Kankakee
Mercer
Stark
Marshall
Livingston
Henderson
Warren
Knox
Peoria
Woodford
Ford
Iroquois
McDonough
Hancock
Fulton
Tazewell
McLean
Mason
Vermilion
Schuyler
De Witt
Logan
Piatt
Champaign
Adams
Brown
Cass
Menard
Macon
Douglas
Sangamon
Morgan
Scott
Pike
Christian
Moultrie
Edgar
Coles
Shelby
Calhoun
Greene
Montgomery
Cumberland
Clark
Macoupin
Jersey
Effingham
Jasper
Crawford
Fayette
Bond
Madison
Clay
Richland
Lawrence
Marion
Clinton
Wayne
Wabash
St. Clair
Edwards
Washington
Monroe
Jefferson
White
Perry
Hamilton
Randolph
Franklin
Saline
Jackson
Williamson
Gallatin
Hardin
Union
Johnson
Pope
Pulaski
Massac
Alexander
N
W
E
S
80
0
80 Miles

# Mississippi

# Nevada


Humboldt
Elko
Pershing
Washoe
Lander
Eureka
Churchill
Storey
White Pine
Carson City
Lyon
Douglas
Mineral
Esmeralda
Nye
Lincoln
Clark
N
W
E
S
100
0
100 Miles

# New Jersey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Passaic
Bergen
Warren
Morris
Essex
Hudson
Union
Hunterdon
Somerset
Middlesex
Mercer
Monmouth
Burlington
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Camden
Gloucester
Salem
Atlantic
Cumberland
Cape May
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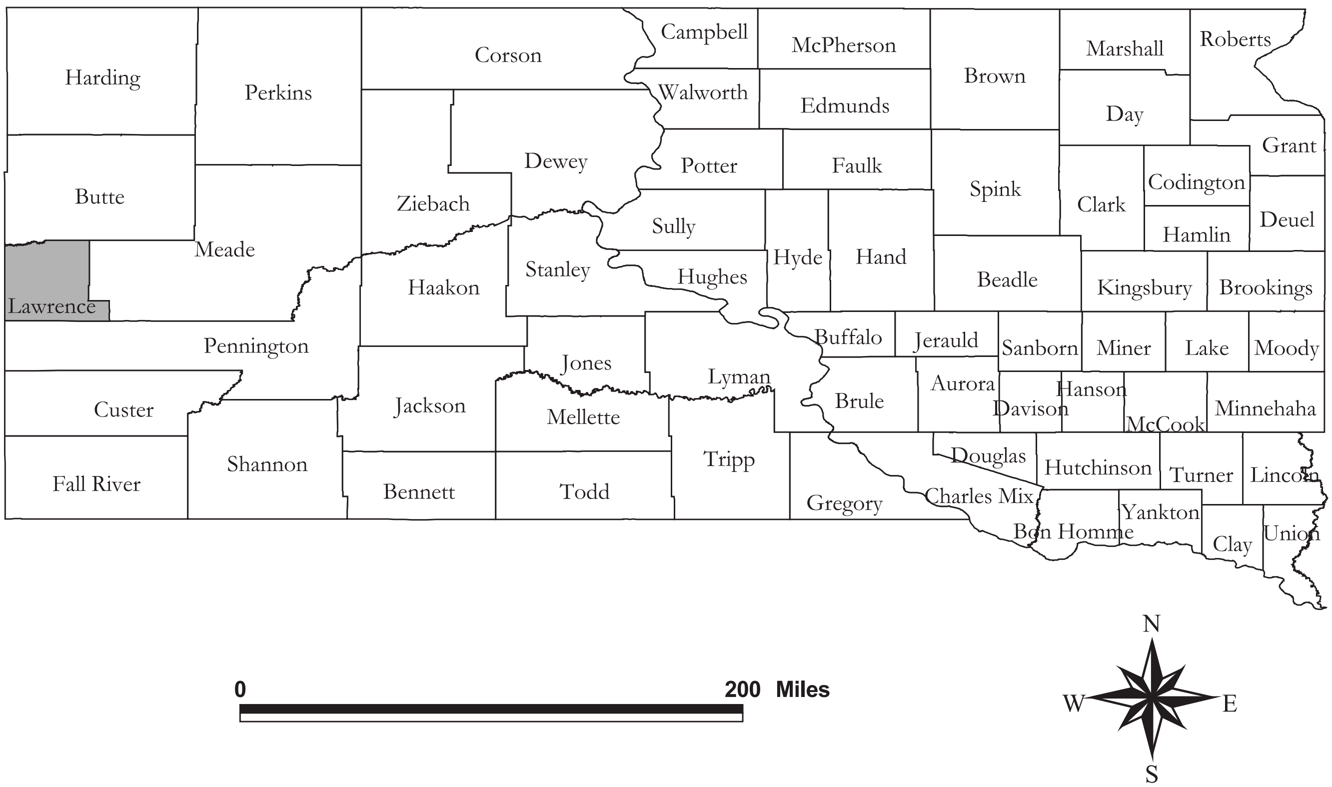
40
0
40 Miles

# South Dakota



BEFORE/AFTER STATISTICS FOR ATLANTIC COUNTY, NJ

| | | Base | Change | t-Ratio | p(t) |
|---|---|---|---|---|---|
| **Test County** | **Atlantic, NJ** | **8.62** | **.659** | **.75** | **.773** |
| **Gaming Controls** | **Honolulu, HI** | **10.46** | **-.081** | **-.12** | **.452** |
| | **Davis, UT** | **9.11** | **1.650** | **1.89** | **.971** |
| | **Salt Lake, UT** | **15.25** | **.240** | **.43** | **.666** |
| | **Utah, UT** | **5.59** | **.065** | **.09** | **.536** |
| | **Weber, UT** | **14.01** | **2.460** | **1.65** | **.951** |
| | **Clark, NV** | **23.11** | **0.28** | **.03** | **.512** |
| | **Washoe, NV** | **28.62** | **-2.108** | **-1.16** | **.123** |
| **Regional Controls** | **Bergen, NJ** | **6.03** | **.040** | **.03** | **.512** |
| | **Burlington, NJ** | **7.22** | **.490** | **.64** | **.739** |
| | **Camden, NJ** | **8.87** | **.289** | **.30** | **.618** |
| | **Cumberland, NJ** | **12.40** | **-2.866** | **-2.43** | **.008** |
| | **Essex, NJ** | **7.23** | **-.717** | **-1.36** | **.087** |
| | **Gloucester, NJ** | **8.88** | **-.793** | **-.81** | **.209** |
| | **Hudson, NJ** | **5.96** | **1.347** | **1.87** | **.969** |
| | **Mercer, NJ** | **7.41** | **.449** | **.61** | **.729** |
| | **Middlesex, NJ** | **6.36** | **.457** | **.81** | **7.91** |
| | **Monmouth, NJ** | **7.68** | **-.343** | **-.61** | **.271** |
| | **Morris, NJ** | **7.56** | **.574** | **.3** | **.767** |
| | **Ocean, NJ** | **8.93** | **-.228** | **-.40** | **.345** |
| | **Passaic, NJ** | **6.25** | **.069** | **.11** | **.544** |
| | **Somerset, NJ** | **7.28** | **.708** | **.88** | **.811** |
| | **Sussex, NJ** | **12.97** | **-5.375** | **-3.20** | **.001** |
| | **Union, NJ** | **6.54** | **-.078** | **.18** | **.571** |
| | **Other, NJ** | **8.93** | **-.029** | **-.05** | **.480** |

BEFORE/AFTER STATISTICS FOR LAWRENCE COUNTY, SD

| | | Base | Change | t-Ratio | p(t) |
|---|---|---|---|---|---|
| **Test County** | **Lawrence, SD** | **19.25** | **-9.726** | **-2.67** | **.004** |
| **Gaming Controls** | **Honolulu, HI** | | **.055** | **.08** | **.532** |
| | **Davis, UT** | | **1.810** | **2.02** | **.978** |
| | **Salt Lake, UT** | | **1.020** | **1.84** | **.967** |
| | **Utah, UT** | | **.117** | **.24** | **.595** |
| | **Weber, UT** | | **3.710** | **2.55** | **.995** |
| | **Clark, NV** | | **-043** | **-.04** | **.484** |
| | **Washoe, NV** | | **-3.165** | **-1.73** | **.042** |
| **Regional Controls** | **Minnehaha, SD** | **10.54** | **1.746** | **1.40** | **.919** |
| | **Other SD** | **11.21** | **.033** | **.23** | **.591** |
| | **Douglas, NE** | **9.02** | **.109** | **.80** | **.788** |
| | **Lancaster, NE** | **10.12** | **3.003** | **2.96** | **.998** |
| | **Other NE** | **10.92** | **.604** | **.80** | **.788** |
| | **Cass, ND** | **10.61** | **1.042** | **.58** | **.719** |
| | **Other ND** | **10.49** | **.148** | **1.37** | **.915** |

BEFORE/AFTER STATISTICS FOR DOUGLAS AND GILPIN COUNTIES, CO

| | | Base | Change | t-Ratio | p(t) |
|---|---|---|---|---|---|
| **Test County** | **Douglas-Gilpin, CO** | **18.59** | **-4.430** | **1.20** | **.115** |
| **Gaming Controls** | **Honolulu, HI** | | **.229** | **.32** | **.626** |
| | **Davis, UT** | | **2.130** | **2.29** | **.989** |
| | **Salt Lake, UT** | | **1.190** | **2.07** | **.981** |
| | **Utah, UT** | | **.212** | **.39** | **.652** |
| | **Weber, UT** | | **4.500** | **3.07** | **.999** |
| | **Clark, NV** | | **.231** | **.33** | **.587** |
| | **Washoe, NV** | | **-3.557** | **-1.86** | **.031** |
| **Regional Controls** | **Adams, CO** | **16.73** | **1.810** | **1.47** | **.929** |
| | **Arapahoe, CO** | **14.35** | **-.058** | **-.08** | **.468** |
| | **Boulder, CO** | **15.65** | **-1.600** | **-1.06** | **.145** |
| | **Denver, CO** | **22.16** | **.364** | **.36** | **.641** |
| | **El Paso, CO** | **15.60** | **.713** | **.66** | **.745** |
| | **Jefferson, CO** | **17.31** | **-1.840** | **-1.53** | **.063** |
| | **Larimer, CO** | **13.59** | **.899** | **.59** | **.722** |
| | **Weld, CO** | **13.96** | **1.670** | **.48** | **.684** |
| | **Other, CO** | **18.17** | **-.239** | **-.25** | **.401** |

BEFORE/AFTER STATISTICS FOR HARRISON COUNTY, MS

| | | Base | Change | t-Ratio | p(t) |
|---|---|---|---|---|---|
| **Test County** | **Harrison, MS** | **12.83** | **2.291** | **1.34** | **.910** |
| **Gaming Controls** | **Honolulu, HI** | **10.27** | **.839** | **1.04** | **.851** |
| | **Davis, UT** | **9.96** | **1.860** | **1.64** | **.949** |
| | **Salt Lake, UT** | **15.35** | **.469** | **.65** | **.742** |
| | **Utah, UT** | **7.46** | **.067** | **.09** | **.536** |
| | **Weber, UT** | **15.35** | **2.310** | **1.19** | **.883** |
| | **Clark, NV** | **23.18** | **-.273** | **-.22** | **.413** |
| | **Washoe, NV** | **27.38** | **-1.442** | **-.60** | **.274** |
| **Regional Controls** | **Calhoun, AL** | **11.94** | **.623** | **.16** | **.564** |
| | **Jefferson, AL** | **11.58** | **-.028** | **-.02** | **.492** |
| | **Madison, AL** | **12.40** | **-2.583** | **-1.55** | **.061** |
| | **Mobile, AL** | **10.44** | **.600** | **.45** | **.674** |
| | **Montgomery, AL** | **9.50** | **-1.051** | **-.87** | **.192** |
| | **Tuscaloosa, AL** | **8.83** | **-.626** | **-.38** | **.352** |
| | **Other AL** | **10.86** | **-.822** | **-.58** | **.281** |
| | **Hinds, MS** | **10.09** | **2.412** | **2.03** | **.979** |
| | **Jackson, MS** | **7.73** | **-302** | **-.20** | **.421** |
| | **Other MS** | **9.54** | **-.724** | **-.60** | **.274** |

BEFORE/AFTER STATISTICS FOR WILL COUNTY, IL

| | | Base | Change | t-Ratio | p(t) |
|---|---|---|---|---|---|
| **Test County** | **Will, IL** | **9.64** | **-1.423** | **-1.00** | **.159** |
| **Gaming Controls** | **Honolulu, HI** | **10.27** | **.839** | **1.04** | **.851** |
| | **Davis, UT** | **9.96** | **1.860** | **1.64** | **.949** |
| | **Salt Lake, UT** | **15.35** | **.469** | **.65** | **.742** |
| | **Utah, UT** | **7.46** | **.067** | **.09** | **.536** |
| | **Weber, UT** | **15.35** | **2.310** | **1.19** | **.883** |
| | **Clark, NV** | **23.18** | **-.273** | **-.22** | **.413** |
| | **Washoe, NV** | **27.38** | **-1.442** | **-.60** | **.274** |
| **Regional Controls** | **Champaign, IL** | **7.41** | **-.027** | **-.04** | **.484** |
| | **Cook, IL** | **9.95** | **-.22** | **-.50** | **.309** |
| | **DuPage, IL** | **8.88** | **-1.127** | **-1.36** | **.087** |
| | **Kane, IL** | **10.27** | **-1.135** | **-.82** | **.206** |
| | **Lake, IL** | **9.23** | **-1.957** | **-2.20** | **.014** |
| | **LaSalle, IL** | **10.94** | **.114** | **.07** | **.528** |
| | **McHenry, IL** | **9.50** | **-2.064** | **-1.58** | **.057** |
| | **McLean, IL** | **8.69** | **-.194** | **-.12** | **.452** |
| | **Macon, IL** | **10.26** | **1.193** | **1.45** | **.926** |
| | **Madison, IL** | **10.62** | **.070** | **.09** | **.536** |
| | **Peoria, IL** | **12.12** | **-1.613** | **-1.02** | **.154** |
| | **Rock Island, IL** | **11.08** | **1.778** | **1.01** | **.844** |
| | **St. Clair, IL** | **10.14** | **-.097** | **-.13** | **.448** |
| | **Sangamon, IL** | **11.16** | **.122** | **.07** | **.528** |
| | **Tazewell, IL** | **10.26** | **1.629** | **.71** | **.761** |
| | **Winnebago, IL** | **12.80** | **-1.423** | **-1.00** | **.159** |
| | **Other IL** | **10.43** | **-.460** | **-.92** | **.179** |

# IV. VISITOR SUICIDES

In Chapter III, we demonstrated that suicide risk for residents of gaming areas is statistically indistinguishable from suicide risk for residents of nongaming areas. In other words, we find no ecological evidence that casino presence elevates the risk of suicide for inhabitants in the surrounding area. But what of suicide risk to the numerous visitors in such settings? How believable is the second of David Phillips' findings, that casino presence elevates suicide risk among visitors? In this chapter we determine whether visitors in gaming areas commit suicides out of proportion to their very high numbers. This is accomplished by estimating and comparing visitor-specific suicide rates for 263 counties and 118 metropolitan areas (every geographical unit for which the relevant data are available). Our results strongly reinforce those of Chapter III: when the appropriate statistical procedures are followed, gaming destinations are only "average" in their risk for visitor suicide. *To put this bottom line another way, Las Vegas, Reno and Atlantic City have visitor suicides only in proportion to their high volume of visitors.* The steps leading to this conclusion are set forth below.

## A. The Visitor Phenomenon

Resident status is a major element of the Phillips *et al*. gambling-suicide theory. In simple terms, Phillips *et al*. report that disproportionately high numbers of suicides occur among interstate visitors to Atlantic City, Las Vegas and Reno. This statistical anomaly has two possible interpretations, of course. First, as Phillips *et al.* argue, the statistical anomaly can mean that "gambling or some factor closely associated with gambling settings" *causes* more suicide. Second, and equally plausible, the anomaly can mean that Atlantic City, Las Vegas and Reno have abnormally high numbers of interstate visitors. Given the importance of resident status to both explanations, it is important to understand the visitor death phenomenon.

### 1. What Do Visitor Deaths Look Like?

Of the 2,315,251 deaths recorded in the United States in 1995, 1,899,098 (82 percent) occurred in the decedent's county of residence; *i.e.*, the person resided and died in the same county. Another 336,980 (14.6 percent) occurred in another county but in the same state of residence. Only 79,173 (3.4 percent) occurred outside the decedent's state of residence — or nation of residence in the case of 3,119 (0.1 percent) foreign residents.

The breakdown of deaths by visitor status is reported in Table IVA1a. Resident-visitor breakdowns by other important variables are reported in Tables IVA1b-e. Given the relatively small number of foreign residents who died in the United States in 1995, foreign residents are treated as "interstate visitors" in these tables.

TABLE IVA1a - DEATHS BY RESIDENT STATUS, 1995

| Residence vs. Occurrence | Number | Percent |
|---|---:|---:|
| **Same County** | **1,899,098** | **82.0%** |
| **Same State** | **336,980** | **14.6%** |
| **Different States** | **76,054** | **3.3%** |
| **Foreign Residents** | **3,119** | **0.1%** |
| **Total** | **2,315,251** | **100.0%** |

If there is a most important, theoretical variable to be considered in the visitor phenomenon, it must be *cause of death.* Breakdowns for selected causes by visitor status are reported in Table IVA1b. A cursory examination of these breakdowns shows that, for the most common causes of death — causes that accounted for two-thirds of all deaths in 1995 — only 2.9 percent occur out of state; in contrast, 3.6 percent of suicides occur out of state. What these breakdowns show is that most deaths are from natural (internal, or originating within the individual) causes and occur at the end of a debilitating disease process that makes interstate travel difficult, if not impossible. Thus, most victims of natural causes are elderly, and/or very sick, and relatively immobile at the time of death.

TABLE IVA1b - CAUSE OF DEATH BY VISITOR STATUS

| | | Residence vs. Occurrence | | | |
|---|---|---|---|---|---|
| **Cause of Death** | **Percent of All Deaths** | **Same County** | **Same State** | **Different State** | **Percent Visitor** |
| **Heart Disease** | **31.9%** | **616,478** | **96,964** | **25,126** | **3.4%** |
| **Cancers** | **22.4%** | **436,691** | **66,988** | **14,976** | **2.9%** |
| **Artery Disease** | **9.2%** | **173,137** | **34,045** | **6,906** | **3.2%** |
| **Pulmonary Disease** | **4.4%** | **86,098** | **14,2292** | **2,613** | **2.5%** |
| | | | | | |
| **Motor Vehicle** | **1.9%** | **25,905** | **13,088** | **4,647** | **14.6%** |
| **Suicide** | **1.4%** | **27,089** | **3,098** | **1,142** | **3.6%** |

This is not true of violent (or external) causes, which are premature, occur mostly among relatively healthy people, and consequently affect individuals capable of mobility (that is, propensity to and capable of travel). This is most true of motor vehicle fatalities, which occur most often among healthy individuals who (by definition) are capable of mobility, and the fact that 14.6 percent of these deaths occurred out of state is not a surprise. Similarly, suicides also are premature deaths, most of which occur among persons capable of travel, so it is no surprise that they are somewhat more likely than other deaths to occur out of state.

TABLE IVA1c - AGE AT DEATH BY VISITOR STATUS

| | | Residence vs. Occurrence | | | |
|---|---|---|---|---|---|
| **Age at Death** | **Percent of All Deaths** | **Same County** | **Same State** | **Different State** | **Percent Visitor** |
| **Under 21 Yrs.** | **3.3%** | **56,828** | **16,590** | **4,120** | **5.3%** |
| **21-45 Yrs.** | **8.2%** | **148,085** | **32,372** | **9,922** | **5.2%** |
| **46-65 Yrs.** | **17.4%** | **319,623** | **66,296** | **17,350** | **14.1%** |
| **Over 65 Yrs.** | **71.0%** | **1,374,562** | **221,722** | **47,781** | **2.9%** |
| | | | | | |
| | **100.0%** | **1,899,098** | **336,980** | **79,173** | **3.4%** |

A related variable is age at death. Breakdowns for age at death by visitor status are reported in Table IVA1c. An examination of these breakdowns also reveals no surprises. The highest proportion of out-of-state deaths is found among the middle-aged (46-65), an age group that combines high mobility with moderately high mortality rates. The second-highest proportion of nonresident deaths occur among younger adults ages 21-45, a group of high mobility and low mortality; next are children and youths, a group of moderate mobility and very low mortality. The lowest proportions of visitor deaths are found among the elderly, a group of low mobility and very high mortality — indeed, their low mobility is a function of their heightened propensity to debilitating disease and natural death.

TABLE IVA1d - SEX BY VISITOR STATUS

| | | Residence vs. Occurrence | | | |
|---|---|---|---|---|---|
| **Sex** | **Percent of All Deaths** | **Same County** | **Same State** | **Different State** | **Percent Visitor** |
| **Female** | **49.2%** | **953,340** | **153,911** | **46,191** | **4.0%** |
| **Male** | **50.8%** | **945,758** | **183,069** | **32,982** | **2.8%** |
| | **100.0%** | **1,899,098** | **336,980** | **79,173** | **3.4%** |

The breakdowns for sex by visitor status, reported in Table IVA1d, may be surprising. We would expect men to suffer higher rates of nonresident mortality due to higher mobility and higher violent death rates, both of which are associated with dying away from one's residence. Yet, while men are more likely to die as *intrastate* visitors — *i.e.*, in their state of residence but not in their county of residence — women are much more likely to die out of state. This may be because women outlive men and, after a husband's death, are more likely to migrate to live with relatives or in institutions in other states and to die away from the states in which they formerly resided.

Breakdowns for race by visitor status are reported in Table IVA1e. Deaths of whites (Americans of European or Hispanic origin) and "other" nonwhites (Americans of Asian, Pacific Islander or Native origin) are more likely than those of than blacks (African Americans) to be nonresident. This is consistent with a correlation between out of state travel and affluence. As the least affluent of the major racial/ethnic groups, blacks are the least likely group to travel out of state.

TABLE IVA1e - RACE BY VISITOR STATUS

| | | Residence vs. Occurrence | | | |
|---|---|---|---|---|---|
| **Race** | **Percent of All Deaths** | **Same County** | **Same State** | **Different State** | **Percent Visitor** |
| **White** | **86.0%** | **1,622,997** | **297,347** | **69,670** | **3.5%** |
| **Black** | **12.4%** | **243,954** | **34,766** | **7,835** | **2.7%** |
| **Other** | **11.6%** | **32,147** | **4,867** | **1,668** | **4.3%** |
| | **100.0%** | **1,899,098** | **336,980** | **79,173** | **3.4%** |

In sum, visitor deaths are disproportionately white or Asian, middle-aged and female. The first two groups have higher-than-average suicide rates. Women, however, have lower suicide rates than men.

2. Where Do Visitor Suicides Come From?

The geographical origins of visitor suicides also is illuminating. During 1968-88[12], Atlantic County, N.J., Clark County, Nev., and Washoe County, Nev., reported that 3,834 suicides occurred in their jurisdictions. Table IVA2b-c shows where these suicide victims resided. Clark and Washoe counties have higher numbers of suicides, which is unsurprising since Western and Sun Belt states have relatively high suicide rates. Otherwise, the proportions of visitor suicides are comparable.[13] The fact that Atlantic County has a higher proportion of *intrastate* visitor suicides — suicides by residents of other counties in the same state — reflects the high population density and geographic compactness of Eastern vs. Western states. New Jersey's population density (7.7 million residents in 7,800 square miles, or 1,042 persons per square mile, in 1990) is 100 times that of Nevada (1.2 million residents in 110,600 square miles, or 11 persons per square mile).

TABLE IVA2a - SUICIDES BY VISITOR STATUS, 1968-88

| | **Residence vs. Occurrence** | | | |
|---|---|---|---|---|
| | **Same County** | **Same State** | **Other State** | **Percent Visitor** |
| **Atlantic County, NJ** | **316** | **42** | **51** | **12.5%** |
| **Clark County, NV** | **1953** | **17** | **347** | **15.0%** |
| **Washoe County, NV** | **934** | **52** | **122** | **11.0%** |
| | **3203** | **111** | **520** | **13.6%** |

Table IVA2b reports the county of residence for *intrastate* visitor suicides in the three counties. The pattern that emerges from this table is dominated by distance and population size. Controlling for distance, counties with large populations account for more visitor suicides. Controlling for population size, the closer the county, the greater its proportion of nonresident suicides; *intrastate* visitor suicides do not travel far to reach these three counties. For Atlantic County, N.J., for example, four adjacent counties — Cape May, Burlington, Ocean and Camden — account for three-fourths of the *intrastate* visitor suicides.

The proximity factor raises an important issue for subsequent analyses. The standard death certificate defines "place of occurrence" to mean "place of death" (that is, the place where the decedent expired, not where he or she suffered the ultimately fatal trauma). Therefore, some of the majority of intrastate visitor suicides may reflect nothing more than routine patterns of trauma care in which patients critically injured or diseased in rural areas are transported to urban hospitals better able to care for them. If a suicide occurring in Cape May County is transported to a trauma center in Atlantic County, for example, the death certificate will list Atlantic County as the place of occurrence. Phillips *et al.* exclude intrastate visitor suicides from their analyses for that reason. Our analyses of visitor suicides in Chapter IV will follow the same convention.

[12]Suicides from 1989-95 are not included in Tables IVA2a-c because of changes in the way that decedents' place of occurrence and place of residence are reported. These changes are discussed in Chapter II.

[13]Visitor suicides include residents of other states and places outside the United States (Canada, Mexico, etc.). The number of foreign residents is relatively small and does not affect any findings reported here.

Table IVA2c reports the state of residence for *interstate* visitor suicides in the three counties. Population size and distance dominate again. For Atlantic County, three adjacent states — Delaware, New York and Pennsylvania — account for 78 percent of the *interstate* visitor suicides. Although Clark County has a larger geographical catchment area than Atlantic or Washoe counties, the proximity effect is significant; Arizona and California account for 42 percent of Clark County's interstate visitor suicides. California accounts for 69 percent of Washoe County's interstate visitor suicides.

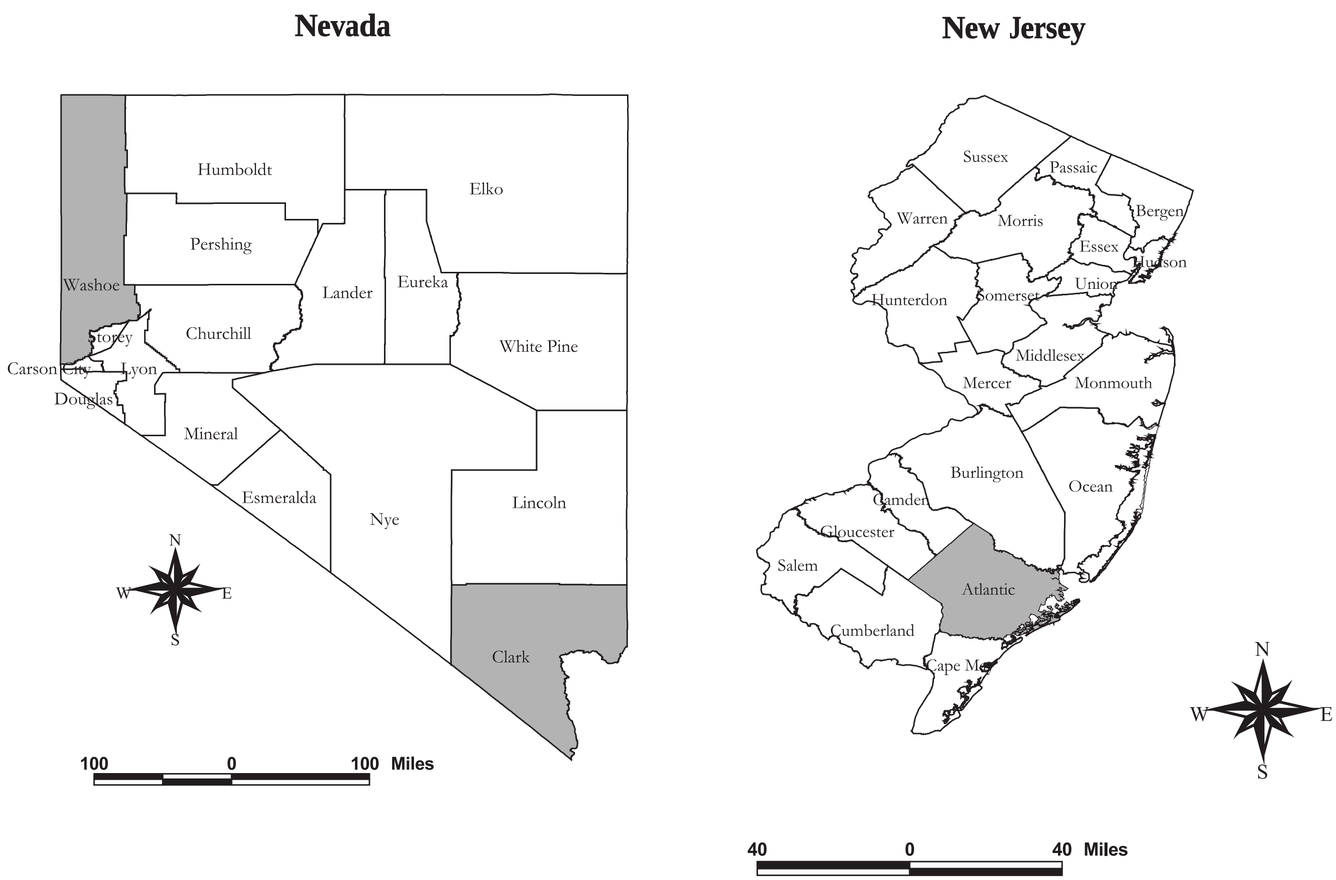
TABLE IVA2b - INTRASTATE VISITOR SUICIDES, 1968-88

| County of Occurrence | County of Residence | N | % |
|---|---|---|---|
| Atlantic County, NJ | Cape May | 19 | 45.2% |
| | Burlington | 5 | 11.9% |
| | Ocean | 4 | 9.5% |
| | Camden | 3 | 7.1% |
| | Bergen | 2 | 4.8% |
| | Cumberland | 2 | 4.8% |
| | Morris | 2 | 4.8% |
| | Five other counties | 5 | 9.5% |
| Clark County, NV | Washoe | 5 | 29.4% |
| | Nye | 4 | 23.5% |
| | Ormsby-Carson City | 3 | 17.6% |
| | Five other counties | 5 | 26.3% |
| Washoe County, NV | Churchill | 11 | 21.2% |
| | Ormsby-Carson City | 9 | 17.3% |
| | Douglas | 7 | 13.5% |
| | Mineral | 6 | 11.5% |
| | Clark | 3 | 5.8% |
| | Humboldt | 3 | 5.8% |
| | Esmeralda | 2 | 3.8% |
| | Lander | 2 | 3.8% |
| | Lyon | 2 | 3.8% |
| | Storey | 2 | 3.8% |
| | White Pine | 2 | 3.8% |
| | Three other counties | 3 | 5.8% |

TABLE IVA2c - INTERSTATE VISITOR SUICIDES, 1968-88

| County of Occurrence | State of Residence | N | % |
|---|---|---|---|
| Atlantic County, NJ | Pennsylvania | 27 | 52.9% |
| | New York | 10 | 19.6% |
| | North Carolina | 3 | 5.9% |
| | Delaware | 2 | 3.9% |
| | Florida | 2 | 3.9% |
| | Six other states | 6 | 12.0% |
| Clark County, NV | California | 120 | 34.6% |
| | Arizona | 25 | 7.2% |
| | Texas | 22 | 6.3% |
| | New York | 17 | 4.9% |
| | Florida | 15 | 4.3% |
| | Michigan | 14 | 4.0% |
| | Illinois | 12 | 3.5% |
| | Colorado | 10 | 2.9% |
| | Missouri | 8 | 2.3% |
| | Washington | 8 | 2.3% |
| | New Jersey | 7 | 2.0% |
| | Wisconsin | 7 | 2.0% |
| | Oklahoma | 6 | 1.7% |
| | Utah | 6 | 1.7% |
| | New Mexico | 5 | 1.4% |
| | 29 other states/countries | 65 | 18.7% |
| Washoe County, NV | California | 84 | 68.9% |
| | Washington | 8 | 6.6% |
| | Oregon | 7 | 5.7% |
| | Colorado | 3 | 2.5% |
| | Florida | 3 | 2.5% |
| | Illinois | 2 | 1.6% |
| | New Mexico | 2 | 1.6% |
| | Ohio | 2 | 1.6% |
| | 8 other states/countries | 8 | 6.6% |

FIGURE IVB - NEVADA AND NEW JERSEY COUNTIES




## B. The Importance of Rates and Visitor Counts

As we argued earlier, rates (not levels) must be used if comparisons of risk among different populations are to be valid. The whole point is to maintain apple-to-apple and orange-to-orange comparisons. It would be ridiculous, for example, to compare the risk of subway accidents in New York City and Bismarck, N.D. (one of these cities has no subway). It would be almost as ridiculous to assert that automobile travel is riskier in the United States because it has more auto fatalities than Botswana. (Botswana, of course, has very few cars, very few roads, and thus very few drivers and passengers "at risk" of being killed while traveling.) Were one to persist in comparing, the appropriate comparison would be of traffic fatality *rates* — say, fatalities *per 100,000 miles of driving.* Finally, to use an example a little closer to the topic at hand, it would be questionable to infer from Florida's very large number of visitor traffic accidents that tourists in Florida drive worse than tourists in Wyoming. (The simpler explanation, of course, is that Florida has proportionately more visitors.) Were one to persist in comparing, the appropriate comparison would be of visitor accident *rates* — say, accidents *per 1,000 tourist visits.*

With these examples in mind, we turn to the article by Phillips *et al.*, which infers from high total numbers of visitor suicides in Las Vegas, Reno and Atlantic City that gaming destination visitors are at elevated risk for suicide. Their chain of inference lacks a crucial link: as illustrated by the examples above, the Phillips team ought first to have determined the number of visitors to each destination. By incorporating this information into a comparisons using the appropriate rates, they in all likelihood would have pre-empted our conclusion in the present report, that the three cities in question have high numbers of visitor suicides for no other reason than that their visitor volume is proportionately high. Evidently, the relevant travel data were not available to Phillips and his co-authors, leaving them to improvise in the face of what the team explicitly recognized as a fundamental gap in their analysis (Phillips 1997: 374 ). Fortunately, the present investigation benefits from data collected in the *1995 American Travel Survey* (ATS) (see Chapter IID), which permit clarification of differences in population at risk that potentially result from differences in tourist or visitor volume.

In the balance of this chapter, we set forth first the results from our analysis of visitor suicide by county, followed by results from our analysis of visitor suicide by metropolitan area.

## C. County-by-County Analysis of Visitor Suicide

***Sampling considerations.*** Counties are the smallest unit of analysis for which deaths are compiled by place of occurrence by the National Center for Health Statistics (see discussion of the Mortality Detail File, Chapter IIA). To preserve the confidentiality of personal records, deaths occurring in smaller counties (below approximately 100,000 to 150,000 in total population size) are attributed to the state as a whole. As a consequence, we limit our analysis to counties whose residents total 150,000 or greater. Our sample consists, therefore, of the 263 most populous counties in the nation.

***Estimation of county visitor volume.*** County visitor volumes (the annual number of person-trips) were extracted from the *1995 American Travel Survey.* Because the *American Travel Survey* defines destinations in terms of metropolitan areas rather than counties, the visitor volume for some counties was estimated by apportioning the same share of metropolitan trips as its metropolitan population share. For example, the inhabitants of Cook County, Ill., comprise 66 percent of the total population in the Chicago metropolitan area, so Cook County was apportioned 66 percent of the total trips destined for the Chicago metropolitan area. DuPage County, Ill., whose residents make up 11 percent of Chicago's population, was apportioned 11 percent of total trips to Chicago, and so on. (The *American Travel Survey* uses "primary metropolitan statistical areas" (what the U.S. census abbreviates "PMSAs") as its principal unit of geography. We will sometimes refer to these as "MSAs," or simply as "metros.")

***Suicide rate computation.*** *The risk of visitor suicide in each county is computed as the number of visitor suicides per 1 million person-trips.* We chose a denominator of 1 million trips in order to obtain rates expressed as whole numbers. In this text we shall refer simply to the "county visitor suicide rate."

***Results.*** County visitor suicide rates for 1995 are presented in Table 4-1, with counties ranked in descending order, from highest to lowest rates. The table also shows each county's population and, in the fourth column, the county's share of its corresponding metro area's total population.

Visitor suicide rates range from a high of 9.2 visitor suicides per million trips in the District of Columbia, to none at all for the lowest-ranked approximately 100 counties. Clark County (Las Vegas) and Washoe County (Reno), Nev., and Atlantic County (Atlantic City), N.J., rank 60th, 85th and 172nd on this list, respectively. The nearly five dozen counties whose rates exceed Clark County's reflect the full coast-to-coast gamut of American geography and range in population size from moderately small (Arlington County, Va.) to well over 1 million. They include a few counties with casino (including American Indian tribal-run) gaming (Orleans Parish, La., and Broward County, Fla., ranked 30th and 31st, respectively), but many more with resolutely none (for example, Salt Lake County, Utah, and Honolulu County, Hawaii, ranked 35th and 38th, respectively.) (St. Louis City, Mo., and Lake

County, Ind., ranked sixth and seventh, respectively, have casinos in 1998, but none had opened when the ATS and other data were collected in 1995.)

Among all counties, Clark (Las Vegas) has the highest total number of visitor suicides (36). But once one factors in the county's large visitor population at risk, Clark County all but disappears into the middle of the suicide risk pack. The story is similar for Washoe County's seven visitor suicides. Atlantic County had two visitor suicides, and also one of the lowest visitor suicide rates among all counties with any visitor suicides. *In short, once traveler volume is used to specify the appropriate population at risk, the surface appearance of elevated visitor suicide risk in casino gaming counties entirely disappears.*

### D. Metro-by-Metro Analysis of Visitor Suicide

Because the data in both Phillips' and the present analysis apply to metropolitan areas as well as counties, we constructed parallel rankings of metropolitan areas (MSAs) by their visitor suicide rates.

***Sampling considerations***. Data for MSAs were obtained by summing the visitor suicides of their component counties. Some MSAs include a mixture of counties with respect to data availability. Some of Atlanta metro's 20 counties, for example, fall below the population size threshold (approximately 100,000 to 150,000) for which the necessary detailed data are reported. In such cases, we included a metro only if data could be obtained for component counties representing at least 80 percent of the metro's total population. Because of its intrinsic interest to the audience for this report, Atlantic City MSA is included although we could re-constititute data for only 70 percent of its total population. Using the foregoing procedures we obtained a sample of 118 metro areas.

***Estimation of metro visitor volume.*** Because ATS destinations are already defined in terms of MSAs, adjustments to the ATS data were unnecessary.

***Suicide rate computation.*** *The risk of visitor suicide in each metro (MSA) is computed as the number of visitor suicides per 1 million person-trips.* We chose a denominator of 1 million trips in order to obtain rates expressed as whole numbers. In this text we shall refer simply to the "metro area visitor suicide rate."

***Results.*** Metro area visitor suicide rates for 1995 are presented in Table 4-2, with metros ranked in descending order, from highest to lowest rates.

Visitor suicide rates range from a high of 8.0 visitor suicides per million trips in Hamilton, Ohio (a part of the greater Cincinnati area), to none at all starting after the 91st-ranked metro (Orlando, Fla.). Las Vegas, Reno and Atlantic City MSAs rank 26th, 37th and 87th on this list, respectively. The roughly two dozen metros whose rates exceed those of Las Vegas include places representing every major region of the United States. There is no evident pattern in the distribution of casino gaming metros throughout this list; Las Vegas and Reno sit in the list's top one-third (along with nongaming metros Portland, Ore.; Omaha, Neb.; and Memphis, for example) whereas Atlantic City sits in the list's bottom third (followed mainly by metros that had no visitor suicides at all). (Gary, Ind., ranked second, was a casino gaming metro in 1998, but had no casinos operating in 1995.)

In 1995, Las Vegas and the District of Columbia had the highest total number of visitor suicides among metros in our sample (36 and 34, respectively). But when the volume of each area's visitors is factored in, their distinctiveness fades dramatically, with the District falling 12 places and Las Vegas tumbling 25. The effect is similar for Reno (seven visitor suicides) and, for that matter, for a handful of other nongaming places such as Phoenix (19) and Pittsburgh (11). In short, the results using MSAs parallel closely the earlier results using counties: *Once visitor volume is used to specify the appropriate population at risk, the surface appearance of elevated visitor suicide risk in casino gaming metros entirely disappears.*

TABLE 4-1. COUNTIES RANKED BY 1995 VISITOR SUICIDE RATE

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 1 | District of Columbia | 552,304 | 0.13 | 16 | 1,742,452 | 9.2 |
| 2 | Arlington County, VA | 173,420 | 0.04 | 5 | 547,119 | 9.2 |
| 3 | Forsyth County, NC | 280,613 | 0.25 | 6 | 734,740 | 8.2 |
| 4 | Butler County, OH | 319,458 | 1.00 | 2 | 249,751 | 8.0 |
| 5 | Multnomah County, OR | 615,118 | 0.36 | 14 | 1,937,592 | 7.2 |
| 6 | St. Louis City, MO | 358,252 | 0.14 | 9 | 1,288,408 | 7.0 |
| 7 | Lake County, IN | 479,755 | 0.77 | 3 | 491,586 | 6.1 |
| 8 | New Castle County, DE | 466,792 | 1.00 | 5 | 999,431 | 5.0 |
| 9 | Hudson County, NJ | 548,848 | 1.00 | 2 | 402,663 | 5.0 |
| 10 | Polk County, FL | 436,218 | 1.00 | 3 | 622,873 | 4.8 |
| 11 | Lucas County, OH | 453,630 | 0.74 | 5 | 1,071,026 | 4.7 |
| 12 | Mercer County, NJ | 329,242 | 1.00 | 3 | 711,142 | 4.2 |
| 13 | Somerset County, NJ | 264,589 | 0.25 | 1 | 247,247 | 4.1 |
| 14 | Suffolk County, MA | 645,520 | 0.13 | 4 | 1,043,925 | 3.8 |
| 15 | Volusia County, FL | 409,750 | 0.91 | 7 | 1,892,031 | 3.7 |
| 16 | Hamilton County, TN | 293,224 | 0.92 | 6 | 1,625,322 | 3.7 |
| 17 | Shelby County, TN | 860,911 | 0.92 | 12 | 3,319,508 | 3.6 |
| 18 | Duval County, FL | 707,909 | 0.72 | 9 | 2,499,522 | 3.6 |
| 19 | Spartanburg County, SC | 240,006 | 0.27 | 2 | 588,801 | 3.4 |
| 20 | Chesapeake City, VA | 187,497 | 0.12 | 3 | 900,573 | 3.3 |
| 21 | El Paso County, CO | 464,759 | 1.00 | 5 | 1,550,128 | 3.2 |
| 22 | Douglas County, NE | 433,306 | 0.74 | 6 | 1,962,268 | 3.1 |
| 23 | Tulsa County, OK | 524,346 | 0.70 | 7 | 2,296,155 | 3.1 |
| 24 | Jefferson County, TX | 244,171 | 0.65 | 2 | 662,246 | 3.0 |
| 25 | Davidson County, TN | 530,250 | 0.49 | 9 | 2,987,125 | 3.0 |
| 26 | Greene County, MO | 224,263 | 0.76 | 4 | 1,395,875 | 2.9 |
| 27 | Pinellas County, FL | 867,788 | 0.40 | 7 | 2,453,764 | 2.9 |
| 28 | Mobile County, AL | 395,813 | 0.77 | 3 | 1,066,866 | 2.8 |
| 29 | Niagara County, NY | 221,482 | 0.19 | 1 | 362,972 | 2.8 |
| 30 | Orleans Parish, LA | 480,681 | 0.37 | 6 | 2,163,818 | 2.8 |
| 31 | Broward County, FL | 1,413,650 | 1.00 | 9 | 3,249,236 | 2.8 |
| 32 | Northampton County, PA | 255,853 | 0.42 | 1 | 365,771 | 2.8 |
| 33 | Hamilton County, OH | 860,391 | 0.56 | 9 | 3,290,385 | 2.7 |
| 34 | Charleston County, SC | 286,013 | 0.56 | 4 | 1,508,147 | 2.7 |
| 35 | Salt Lake County, UT | 814,720 | 0.68 | 7 | 2,700,494 | 2.6 |
| 36 | Richmond City, VA | 193,306 | 0.21 | 2 | 838,447 | 2.4 |
| 37 | Allen County, IN | 308,021 | 0.65 | 2 | 849,986 | 2.4 |
| 38 | Honolulu County, HI | 869,147 | 1.00 | 5 | 2,121,191 | 2.4 |
| 39 | Allegheny County, PA | 1,304,644 | 0.55 | 9 | 3,829,051 | 2.4 |

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 40 | Kane County, IL | 359,472 | 0.05 | 2 | 854,626 | 2.4 |
| 41 | Richmond County, GA | 194,617 | 0.65 | 2 | 872,966 | 2.3 |
| 42 | San Bernardino County, CA | 1,574,306 | 0.53 | 9 | 3,983,941 | 2.3 |
| 43 | Lexington County, SC | 191,325 | 0.39 | 2 | 889,553 | 2.3 |
| 44 | Lake County, OH | 222,145 | 0.10 | 1 | 447,602 | 2.3 |
| 45 | Fulton County, GA | 701,005 | 0.20 | 7 | 3,203,578 | 2.2 |
| 46 | Clark County, WA | 292,916 | 0.17 | 2 | 922,671 | 2.2 |
| 47 | Brevard County, FL | 449,834 | 1.00 | 3 | 1,386,664 | 2.2 |
| 48 | Richland County, SC | 299,375 | 0.61 | 3 | 1,391,924 | 2.2 |
| 49 | Westchester County, NY | 889,757 | 0.10 | 3 | 1,399,745 | 2.2 |
| 50 | Utah County, UT | 310,826 | 1.00 | 2 | 935,460 | 2.1 |
| 51 | Sedgwick County, KS | 428,633 | 0.83 | 3 | 1,403,840 | 2.1 |
| 52 | Butler County, PA | 165,149 | 0.07 | 1 | 484,702 | 2.1 |
| 53 | Albany County, NY | 297,952 | 0.34 | 2 | 972,029 | 2.1 |
| 54 | Ottawa County, MI | 210,289 | 0.21 | 1 | 498,313 | 2.0 |
| 55 | Durham County, NC | 194,589 | 0.20 | 2 | 993,619 | 2.0 |
| 56 | Baltimore City, MD | 687,365 | 0.28 | 3 | 1,528,122 | 2.0 |
| 57 | Anne Arundel County, MD | 461,309 | 0.19 | 2 | 1,025,564 | 2.0 |
| 58 | Passaic County, NJ | 478,742 | 0.36 | 1 | 521,522 | 1.9 |
| 59 | Arapahoe County, CO | 447,039 | 0.24 | 3 | 1,568,764 | 1.9 |
| 60 | Clark County, NV | 993,571 | 0.98 | 36 | 18,805,142 | 1.9 |
| 61 | Gloucester County, NJ | 242,606 | 0.05 | 1 | 532,985 | 1.9 |
| 62 | Ramsey County, MN | 483,230 | 0.18 | 3 | 1,624,823 | 1.9 |
| 63 | Manatee County, FL | 229,944 | 0.44 | 3 | 1,634,290 | 1.8 |
| 64 | Maricopa County, AZ | 2,526,113 | 0.95 | 17 | 9,248,733 | 1.8 |
| 65 | Philadelphia County, PA | 1,496,924 | 0.30 | 6 | 3,288,613 | 1.8 |
| 66 | Frederick County, MD | 176,211 | 0.04 | 1 | 555,924 | 1.8 |
| 67 | Camden County, NJ | 505,922 | 0.10 | 2 | 1,111,467 | 1.8 |
| 68 | Caddo Parish, LA | 245,917 | 0.65 | 2 | 1,118,360 | 1.8 |
| 69 | Lorain County, OH | 280,212 | 0.13 | 1 | 564,602 | 1.8 |
| 70 | Wyandotte County, KS | 153,915 | 0.09 | 1 | 564,617 | 1.8 |
| 71 | Fairfax County, VA | 887,820 | 0.20 | 5 | 2,800,964 | 1.8 |
| 72 | Norfolk City, VA | 235,427 | 0.16 | 2 | 1,130,787 | 1.8 |
| 73 | Fairfield County, CT | 828,544 | 0.27 | 1 | 575,209 | 1.8 |
| 74 | San Joaquin County, CA | 524,521 | 1.00 | 1 | 577,428 | 1.7 |
| 75 | Washington County, OR | 371,404 | 0.22 | 2 | 1,169,905 | 1.7 |
| 76 | Broome County, NY | 204,602 | 0.79 | 1 | 587,966 | 1.7 |
| 77 | St. Joseph County, IN | 256,479 | 1.00 | 2 | 1,184,966 | 1.7 |
| 78 | Escambia County, FL | 273,934 | 0.72 | 2 | 1,195,534 | 1.7 |
| 79 | Jefferson County, KY | 671,336 | 0.87 | 4 | 2,396,752 | 1.7 |
| 80 | Prince George's County, MD | 759,841 | 0.17 | 4 | 2,397,206 | 1.7 |

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 81 | Washington County, MN | 181,517 | 0.07 | 1 | 610,337 | 1.7 |
| 82 | Marin County, CA | 234,463 | 0.14 | 2 | 1,215,596 | 1.7 |
| 83 | Lane County, OR | 302,954 | 1.00 | 2 | 1,219,396 | 1.6 |
| 84 | Clay County, MO | 167,034 | 0.10 | 1 | 612,743 | 1.6 |
| 85 | Washoe County, NV | 290,754 | 1.00 | 7 | 4,268,778 | 1.6 |
| 86 | Dane County, WI | 392,198 | 1.00 | 4 | 2,456,795 | 1.6 |
| 87 | Kent County, MI | 530,898 | 0.53 | 2 | 1,258,046 | 1.6 |
| 88 | Bucks County, PA | 573,570 | 0.12 | 2 | 1,260,084 | 1.6 |
| 89 | Saratoga County, NY | 194,212 | 0.22 | 1 | 633,591 | 1.6 |
| 90 | El Paso County, TX | 676,703 | 1.00 | 2 | 1,269,925 | 1.6 |
| 91 | Pima County, AZ | 754,728 | 1.00 | 5 | 3,201,120 | 1.6 |
| 92 | Middlesex County, NJ | 696,203 | 0.65 | 1 | 650,570 | 1.6 |
| 93 | Oakland County, MI | 1,149,516 | 0.26 | 3 | 1,944,578 | 1.5 |
| 94 | Ingham County, MI | 284,882 | 0.64 | 1 | 656,160 | 1.5 |
| 95 | Wake County, NC | 514,500 | 0.52 | 4 | 2,627,162 | 1.5 |
| 96 | Solano County, CA | 364,413 | 0.76 | 1 | 664,086 | 1.5 |
| 97 | Stark County, OH | 374,035 | 0.93 | 1 | 667,667 | 1.5 |
| 98 | Ada County, ID | 252,041 | 0.70 | 2 | 1,364,539 | 1.5 |
| 99 | Knox County, TN | 360,860 | 0.56 | 5 | 3,412,917 | 1.5 |
| 100 | Pulaski County, AR | 350,950 | 0.65 | 3 | 2,109,778 | 1.4 |
| 102 | Cuyahoga County, OH | 1,405,574 | 0.63 | 4 | 2,832,106 | 1.4 |
| 103 | Dutchess County, NY | 261,363 | 1.00 | 1 | 727,496 | 1.4 |
| 104 | Mecklenburg County, NC | 579,111 | 0.51 | 3 | 2,172,077 | 1.4 |
| 105 | Johnson County, KS | 399,862 | 0.24 | 2 | 1,466,842 | 1.4 |
| 106 | Montgomery County, TX | 233,663 | 0.06 | 1 | 748,979 | 1.3 |
| 107 | Santa Clara County, CA | 1,566,558 | 1.00 | 4 | 2,997,149 | 1.3 |
| 108 | St. Tammany Parish, LA | 173,031 | 0.13 | 1 | 778,911 | 1.3 |
| 109 | Jackson County, MO | 643,823 | 0.39 | 3 | 2,361,781 | 1.3 |
| 110 | Onondaga County, NY | 468,958 | 0.63 | 2 | 1,581,358 | 1.3 |
| 111 | Baltimore County, MD | 713,097 | 0.29 | 2 | 1,585,329 | 1.3 |
| 112 | Lancaster County, PA | 447,309 | 1.00 | 2 | 1,640,711 | 1.2 |
| 113 | Bristol County, MA | 512,502 | 0.10 | 1 | 828,810 | 1.2 |
| 114 | Spokane County, WA | 401,304 | 1.00 | 3 | 2,551,254 | 1.2 |
| 115 | Newport News City, VA | 178,700 | 0.12 | 1 | 858,320 | 1.2 |
| 116 | Erie County, PA | 280,166 | 1.00 | 1 | 881,918 | 1.1 |
| 117 | St. Charles County, MO | 247,860 | 0.10 | 1 | 891,397 | 1.1 |
| 118 | Burlington County, NJ | 412,276 | 0.08 | 1 | 905,735 | 1.1 |
| 119 | Clayton County, GA | 198,388 | 0.06 | 1 | 906,629 | 1.1 |
| 120 | King County, WA | 1,596,823 | 0.73 | 5 | 4,509,333 | 1.1 |
| 121 | Dade County, FL | 2,028,508 | 1.00 | 5 | 4,541,144 | 1.1 |
| 122 | Madison County, IL | 256,747 | 0.10 | 1 | 923,358 | 1.1 |

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 123 | Morris County, NJ | 443,269 | 0.23 | 1 | 980,252 | 1.0 |
| 124 | Clackamas County, OR | 316,268 | 0.18 | 1 | 996,229 | 1.0 |
| 125 | Oklahoma County, OK | 623,871 | 0.62 | 3 | 3,017,128 | 1.0 |
| 126 | Norfolk County, MA | 632,838 | 0.13 | 1 | 1,023,416 | 1.0 |
| 127 | Jefferson Parish, LA | 455,333 | 0.35 | 2 | 2,049,712 | 1.0 |
| 128 | Henrico County, VA | 238,659 | 0.26 | 1 | 1,035,161 | 1.0 |
| 129 | Placer County, CA | 206,431 | 0.14 | 1 | 1,035,444 | 1.0 |
| 130 | Adams County, CO | 302,151 | 0.17 | 1 | 1,060,318 | 1.0 |
| 131 | Contra Costa County, CA | 869,752 | 0.39 | 1 | 1,082,621 | 0.9 |
| 132 | East Baton Rouge Parish, LA | 395,820 | 0.70 | 1 | 1,093,033 | 0.9 |
| 133 | Essex County, MA | 680,868 | 0.14 | 1 | 1,101,089 | 0.9 |
| 134 | Westmoreland County, PA | 376,192 | 0.16 | 1 | 1,104,101 | 0.9 |
| 135 | Cook County, IL | 5,100,306 | 0.66 | 11 | 12,125,719 | 0.9 |
| 136 | San Mateo County, CA | 677,704 | 0.41 | 3 | 3,513,621 | 0.9 |
| 137 | Delaware County, PA | 547,681 | 0.11 | 1 | 1,203,208 | 0.8 |
| 138 | Nueces County, TX | 312,024 | 0.82 | 2 | 2,406,553 | 0.8 |
| 139 | St. Louis County, MO | 1,003,487 | 0.39 | 3 | 3,608,913 | 0.8 |
| 140 | Montgomery County, M | 810,069 | 0.18 | 2 | 2,555,669 | 0.8 |
| 141 | Dallas County, TX | 1,965,775 | 0.67 | 7 | 9,091,657 | 0.8 |
| 142 | Nassau County, NY | 1,301,114 | 0.49 | 1 | 1,341,599 | 0.8 |
| 143 | Kanawha County, WV | 205,633 | 0.81 | 1 | 1,352,333 | 0.7 |
| 144 | Lake County, IL | 569,777 | 0.07 | 1 | 1,354,616 | 0.7 |
| 145 | Hinds County, MS | 249,906 | 0.60 | 1 | 1,354,743 | 0.7 |
| 146 | Fayette County, KY | 237,597 | 0.55 | 1 | 1,365,615 | 0.7 |
| 147 | Palm Beach County, FL | 977,795 | 1.00 | 2 | 2,740,065 | 0.7 |
| 148 | Suffolk County, NY | 1,350,264 | 0.51 | 1 | 1,392,278 | 0.7 |
| 149 | Los Angeles County, CA | 9,054,394 | 1.00 | 10 | 14,134,907 | 0.7 |
| 150 | Bernalillo County, NM | 522,747 | 0.79 | 2 | 3,028,912 | 0.7 |
| 151 | Lake County, FL | 180,436 | 0.13 | 1 | 1,555,723 | 0.6 |
| 152 | Erie County, NY | 959,032 | 0.81 | 1 | 1,571,692, | 0.6 |
| 153 | Leon County, FL | 213,696 | 0.83 | 1 | 1,589,782 | 0.6 |
| 154 | Montgomery County, OH | 567,907 | 0.60 | 1 | 1,640,634 | 0.6 |
| 155 | San Diego County, CA | 2,645,569 | 1.00 | 7 | 11,400,611 | 0.6 |
| 156 | Tarrant County, TX | 1,274,416 | 0.86 | 1 | 1,654,546 | 0.6 |
| 157 | Alameda County, CA | 1,343,692 | 0.61 | 1 | 1,672,557 | 0.6 |
| 158 | Jefferson County, CO | 484,394 | 0.27 | 1 | 1,699,852 | 0.6 |
| 159 | Genesee County, MI | 434,065 | 1.00 | 1 | 1,706,146 | 0.6 |
| 160 | Denver County, CO | 493,752 | 0.27 | 1 | 1,732,691 | 0.6 |
| 161 | Riverside County, CA | 1,389,679 | 0.47 | 2 | 3,516,724 | 0.6 |
| 162 | Hennepin County, MN | 1,051,961 | 0.40 | 2 | 3,537,136 | 0.6 |
| 163 | Kern County, CA | 615,593 | 1.00 | 1 | 1,876,861 | 0.5 |

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 164 | San Francisco County, CA | 727,294 | 0.44 | 2 | 3,770,725 | 0.5 |
| 165 | DuPage County, IL | 852,235 | 0.11 | 1 | 2,026,146 | 0.5 |
| 166 | Milwaukee County, WI | 925,992 | 0.64 | 1 | 2,042,591 | 0.5 |
| 167 | Virginia Beach City, VA | 428,568 | 0.28 | 1 | 2,058,469, | 0.5 |
| 168 | Monterey County, CA | 344,886 | 1.00 | 1 | 2,293,350 | 0.4 |
| 169 | Harris County, TX | 3,074,327 | 0.83 | 4 | 9,854,386 | 0.4 |
| 170 | Hillsborough County, FL | 884,005 | 0.41 | 2 | 499,619 | 0.4 |
| 171 | Franklin County, OH | 1,008,204 | 0.70 | 2 | 5,383,946 | 0.4 |
| 172 | Atlantic County, NJ | 233,163 | 0.70 | 2 | 6,302,910 | 0.3 |
| 173 | Jefferson County, AL | 662,555 | 0.75 | 1 | 3,364,788 | 0.3 |
| 174 | Bexar County, TX | 1,293,783 | 0.90 | 2 | 7,322,738 | 0.3 |
| 175 | Marion County, IN | 815,011 | 0.55 | 1 | 3,972,274 | 0.3 |
| 176 | Sacramento County, CA | 1,103,242 | 0.76 | 1 | 5,533,787 | 0.2 |
| 177 | New London County, CT | 253,261 | 0.08 | 0 | 175,824 | 0.1 |
| 178 | St. Clair County, MI | 154,199 | 0.03 | 0 | 260,851 | 0.0 |
| 179 | Trumbull County, OH | 227,336 | 0.38 | 0 | 295,500 | 0.0 |
| 180 | Kent County, RI | 162,162 | 0.16 | 0 | 336,123 | 0.0 |
| 181 | Marion County, OR | 256,058 | 0.82 | 0 | 337,760 | 0.0 |
| 182 | Mahoning County, OH | 261,194 | 0.44 | 0 | 339,510 | 0.0 |
| 183 | Stanislaus County, CA | 410,477 | 1.00 | 0 | 341,526 | 0.0 |
| 184 | Anderson County, SC | 154,245 | 0.17 | 0 | 378,406 | 0.0 |
| 185 | Muskegon County, MI | 163,657 | 0.16 | 0 | 387,811 | 0.0 |
| 186 | Lehigh County, PA | 296,794 | 0.49 | 0 | 424,301 | 0.0 |
| 187 | Rockland County, NY | 276,623 | 0.03 | 0 | 435,177 | 0.0 |
| 188 | Saginaw County, MI | 211,719 | 0.53 | 0 | 440,611 | 0.0 |
| 189 | Peoria County, IL | 183,308 | 0.53 | 0 | 454,280 | 0.0 |
| 190 | Winnebago County, IL | 263,509 | 0.76 | 0 | 455,243 | 0.0 |
| 191 | Harford County, MD | 205,243 | 0.08 | 0 | 456,288 | 0.0 |
| 192 | York County, PA | 364,496 | 1.00 | 0 | 469,933 | 0.0 |
| 193 | Howard County, MD | 219,225 | 0.09 | 0 | 487,372 | 0.0 |
| 194 | Outagamie County, WI | 150,416 | 0.45 | 0 | 497,023 | 0.0 |
| 195 | Rensselaer County, NY | 155,260 | 0.18 | 0 | 506,515 | 0.0 |
| 196 | McHenry County, IL | 224,569 | 0.03 | 0 | 533,901 | 0.0 |
| 197 | Bibb County, GA | 154,320 | 0.50 | 0 | 542,104 | 0.0 |
| 198 | Beaver County, PA | 187,453 | 0.08 | 0 | 550,163 | 0.0 |
| 199 | Boulder County, CO | 253,678 | 1.00 | 0 | 562,740 | 0.0 |
| 200 | Hartford County, CT | 831,941 | 0.28 | 0 | 577,568 | 0.0 |
| 201 | Weber County, UT | 175,783 | 0.15 | 0 | 582,655 | 0.0 |
| 202 | Washington County, PA | 206,713 | 0.09 | 0 | 606,690 | 0.0 |
| 203 | Berks County, PA | 350,320 | 1.00 | 0 | 631,750 | 0.0 |
| 204 | Oneida County, NY | 241,529 | 0.78 | 0 | 637,776 | 0.0 |

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 205 | Clermont County, OH | 166,877 | 0.11 | 0 | 638,186 | 0.0 |
| 206 | Jefferson County, MO | 186,153 | 0.07 | 0 | 669,476 | 0.0 |
| 207 | Gaston County, NC | 181,052 | 0.16 | 0 | 679,073 | 0.0 |
| 208 | Davis County, UT | 215,116 | 0.18 | 0 | 713,030 | 0.0 |
| 209 | Hidalgo County, TX | 480,679 | 1.00 | 0 | 717,483 | 0.0 |
| 210 | Plymouth County, MA | 452,325 | 0.09 | 0 | 731,493 | 0.0 |
| 211 | Lackawanna County, PA | 214,746 | 0.34 | 0 | 733,465 | 0.0 |
| 212 | Kalamazoo County, MI | 228,077 | 0.52 | 0 | 738,357 | 0.0 |
| 213 | Waukesha County, WI | 337,639 | 0.23 | 0 | 744,778 | 0.0 |
| 214 | Prince William County, VA | 242,395 | 0.06 | 0 | 764,727 | 0.0 |
| 215 | Pierce County, WA | 647,187 | 1.00 | 0 | 784,977 | 0.0 |
| 216 | Washtenaw County, MI | 291,618 | 0.56 | 0 | 786,817 | 0.0 |
| 217 | Cumberland County, PA | 205,428 | 0.34 | 0 | 805,509 | 0.0 |
| 218 | Greenville County, SC | 339,164 | 0.38 | 0 | 832,064 | 0.0 |
| 219 | Williamson County, TX | 184,006 | 0.18 | 0 | 835,703 | 0.0 |
| 220 | Pasco County, FL | 305,554 | 0.14 | 0 | 863,987 | 0.0 |
| 221 | Chester County, PA | 404,393 | 0.08 | 0 | 888,417 | 0.0 |
| 222 | Madison County, AL | 268,609 | 0.82 | 0 | 893,780 | 0.0 |
| 223 | Summit County, OH | 527,892 | 0.78 | 0 | 896,483 | 0.0 |
| 224 | Bergen County, NJ | 841,331 | 0.64 | 0 | 916,512 | 0.0 |
| 225 | Cleveland County, OK | 191,015 | 0.19 | 0 | 923,775 | 0.0 |
| 226 | Anoka County, MN | 276,015 | 0.10 | 0 | 928,079 | 0.0 |
| 227 | Fort Bend County, TX | 292,078 | 0.08 | 0 | 936,221 | 0.0 |
| 228 | Orange County, NY | 321,966 | 1.00 | 0 | 942,939 | 0.0 |
| 229 | St. Clair County, IL | 264,917 | 0.10 | 0 | 952,740 | 0.0 |
| 230 | Cumberland County, NC | 284,307 | 1.00 | 0 | 953,018 | 0.0 |
| 231 | Dauphin County, PA | 245,496 | 0.40 | 0 | 962,621 | 0.0 |
| 232 | Guilford County, NC | 374,360 | 0.33 | 0 | 980,201 | 0.0 |
| 233 | Will County, IL | 413,958 | 0.05 | 0 | 984,164 | 0.0 |
| 234 | Chesterfield County, VA | 237,298 | 0.26 | 0 | 1,029,258 | 0.0 |
| 235 | Dakota County, MN | 318,465 | 0.12 | 0 | 1,070,814 | 0.0 |
| 236 | Union County, NJ | 495,394 | 0.26 | 0 | 1,095,522 | 0.0 |
| 237 | Luzerne County, PA | 323,369 | 0.51 | 0 | 1,104,467 | 0.0 |
| 238 | Montgomery County, AL | 217,666 | 0.69 | 0 | 1,108,710 | 0.0 |
| 239 | Ocean County, NJ | 465,359 | 0.44 | 0 | 1,139,602 | 0.0 |
| 240 | Providence County, RI | 579,415 | 0.59 | 0 | 1,200,988 | 0.0 |
| 241 | Macomb County, MI | 766,210 | 0.17 | 0 | 1,296,158 | 0.0 |
| 242 | Fresno County, CA | 738,086 | 0.87 | 0 | 1,364,048 | 0.0 |
| 243 | Monmouth County, NJ | 583,979 | 0.56 | 0 | 1,430,086 | 0.0 |
| 244 | Snohomish County, WA | 532,979 | 0.24 | 0 | 1,505,101 | 0.0 |
| 245 | Denton County, TX | 333,536 | 0.11 | 0 | 1,542,595 | 0.0 |

| | County | 1995 Population | County Share of MSA | Visitor Suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|---|---|
| 246 | Montgomery County, PA | 704,405 | 0.14 | 0 | 1,547,517 | 0.0 |
| 247 | Monroe County, NY | 721,308 | 0.66 | 0 | 1,568,375 | 0.0 |
| 248 | Collin County, TX | 348,647 | 0.12 | 0 | 1,612,483 | 0.0 |
| 249 | Essex County, NJ | 758,365 | 0.39 | 0 | 1,677,060 | 0.0 |
| 250 | Ventura County, CA | 706,973 | 1.00 | 0 | 1,729,063 | 0.0 |
| 251 | Sonoma County, CA | 416,129 | 1.00 | 0 | 1,781,083 | 0.0 |
| 252 | Polk County, IA | 350,434 | 0.83 | 0 | 1,834,949 | 0.0 |
| 253 | Lee County, FL | 375,112 | 1.00 | 0 | 1,875,539 | 0.0 |
| 254 | Gwinnett County, GA | 457,561 | 0.13 | 0 | 2,091,044 | 0.0 |
| 255 | Sarasota County, FL | 294,937 | 0.56 | 0 | 2,096,218 | 0.0 |
| 256 | Santa Barbara County, CA | 383,269 | 1.00 | 0 | 2,312,053 | 0.0 |
| 257 | Cobb County, GA | 524,929 | 0.15 | 0 | 2,398,914 | 0.0 |
| 258 | DeKalb County, GA | 583,172 | 0.17 | 0 | 2,665,084 | 0.0 |
| 259 | Seminole County, FL | 329,999 | 0.24 | 0 | 2,845,258 | 0.0 |
| 260 | Travis County, TX | 667,653 | 0.67 | 0 | 3,032,289 | 0.0 |
| 261 | Wayne County, MI | 2,131,343 | 0.48 | 0 | 3,605,484 | 0.0 |
| 262 | Orange County, CA | 2,586,435 | 1.00 | 0 | 4,040,876 | 0.0 |
| 263 | Orange County, FL | 749,909 | 0.54 | 0 | 6,465,731 | 0.0 |

TABLE 4-2. METROPOLITAN AREAS RANKED BY 1995 VISITOR SUICIDE RATE

Includes places where data are available for component counties making up at least 80 percent of the metro area population (except Atlantic City, data for 70 percent of population).

| | Metro Area Name | Visitor suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|
| 1 | Hamilton, OH | 2 | 249,751 | 8.0 |
| 2 | Gary, IN | 4 | 635,083 | 6.3 |
| 3 | Wilmington, DE | 5 | 999,431 | 5.0 |
| 4 | Jersey City, NJ | 2 | 402,663 | 5.0 |
| 5 | Lakeland, FL | 3 | 622,873 | 4.8 |
| 6 | Trenton, NJ | 3 | 711,142 | 4.2 |
| 7 | Portland, OR | 19 | 5,026,397 | 3.8 |
| 8 | Toledo, OH | 5 | 1,346,675 | 3.7 |
| 9 | Daytona Beach, FL | 7 | 1,892,031 | 3.7 |
| 10 | Chattanooga, TN | 6 | 1,625,322 | 3.7 |
| 11 | Memphis, TN | 12 | 3,319,508 | 3.6 |
| 12 | Colorado Springs, CO | 5 | 1,550,128 | 3.2 |
| 13 | Jacksonville, FL | 9 | 2,939,403 | 3.1 |
| 14 | Washington, DC | 34 | 12,075,088 | 2.8 |
| 15 | Ft. Lauderdale, FL | 9 | 3,249,236 | 2.8 |
| 16 | Omaha, NE | 6 | 2,470,494 | 2.4 |
| 17 | Honolulu, HI | 5 | 2,121,191 | 2.4 |
| 18 | Vallejo, CA | 2 | 875,682 | 2.3 |
| 19 | Greensboro, NC | 6 | 2,669,270 | 2.3 |
| 20 | Columbia, SC | 5 | 2,281,477 | 2.2 |
| 21 | Melbourne, FL | 3 | 1,386,664 | 2.2 |
| 22 | Provo, UT | 2 | 935,460 | 2.1 |
| 23 | Wichita, KS | 3 | 1,403,840 | 2.1 |
| 24 | Middlesex-Somerset, NJ | 2 | 1,006,285 | 2.0 |
| 25 | Phoenix, AZ | 19 | 9,744,276 | 2.0 |
| 26 | Las Vegas, NV | 36 | 18,805,142 | 1.9 |
| 27 | Baltimore, MD | 10 | 5,394,052 | 1.9 |
| 28 | Cincinnati, OH | 9 | 4,984,940 | 1.8 |
| 29 | Charleston, SC | 4 | 2,219,691 | 1.8 |
| 30 | New Orleans, LA | 9 | 4,992,441 | 1.8 |
| 31 | Salt Lake City, UT | 7 | 3,996,179 | 1.8 |
| 32 | Stockton, CA | 1 | 577,428 | 1.7 |
| 33 | South Bend, IN | 2 | 1,184,966 | 1.7 |
| 34 | St. Louis, MO | 14 | 8,334,291 | 1.7 |
| 35 | Louisville, KY | 4 | 2,396,752 | 1.7 |
| 36 | Eugene, OR | 2 | 1,219,396 | 1.6 |
| 37 | Reno, NV | 7 | 4,268,778 | 1.6 |

| | Metro Area Name | Visitor suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|
| 38 | Madison, WI | 4 | 2,456,795 | 1.6 |
| 39 | El Paso, TX | 2 | 1,269,925 | 1.6 |
| 40 | Pittsburgh, PA | 11 | 7,002,967 | 1.6 |
| 41 | Tucson, AZ | 5 | 3,201,120 | 1.6 |
| 42 | Canton, OH | 1 | 667,667 | 1.5 |
| 43 | Riverside, CA | 11 | 7,500,665 | 1.5 |
| 44 | Tampa, FL | 9 | 6,155,462 | 1.5 |
| 45 | Cleveland, OH | 6 | 4,118,366 | 1.5 |
| 46 | Grand Rapids, MI | 3 | 2,144,169 | 1.4 |
| 47 | Kansas City, MO | 7 | 5,005,983 | 1.4 |
| 48 | Dutchess Cnty, NY | 1 | 727,496 | 1.4 |
| 49 | San Jose, CA | 4 | 2,997,149 | 1.3 |
| 50 | Norfolk, VA | 8 | 6,102,369 | 1.3 |
| 51 | Allentown, PA | 1 | 790,072 | 1.3 |
| 52 | Lancaster, PA | 2 | 1,640,711 | 1.2 |
| 53 | Philadelphia, PA | 13 | 10,738,026 | 1.2 |
| 54 | Spokane, WA | 3 | 2,551,254 | 1.2 |
| 55 | Albany, NY | 3 | 2,597,379 | 1.2 |
| 56 | Erie, PA | 1 | 881,918 | 1.1 |
| 57 | Greenville, SC | 2 | 1,799,271 | 1.1 |
| 58 | Miami, FL | 5 | 4,541,144 | 1.1 |
| 59 | Buffalo, NY | 2 | 1,934,664 | 1.0 |
| 60 | Appleton, WI | 1 | 986,869 | 1.0 |
| 61 | Denver, CO | 6 | 6,061,625 | 1.0 |
| 62 | Chicago, IL | 15 | 17,879,173 | 0.8 |
| 63 | Corpus Christi, TX | 2 | 2,406,553 | 0.8 |
| 64 | Seattle, WA | 5 | 6,014,434 | 0.8 |
| 65 | San Francisco, CA | 7 | 8,499,942 | 0.8 |
| 66 | Dayton, OH | 2 | 2,472,156 | 0.8 |
| 67 | Sarasota, FL | 3 | 3,730,508 | 0.8 |
| 68 | Minneapolis, MN | 6 | 7,771,188 | 0.8 |
| 69 | Oklahoma City, OK | 3 | 3,940,903 | 0.8 |
| 70 | Charleston, WV | 1 | 1,352,333 | 0.7 |
| 71 | Nassau-Suffolk, NY | 2 | 2,733,877 | 0.7 |
| 72 | W. Palm Beach, FL | 2 | 2,740,065 | 0.7 |
| 73 | Oakland, CA | 2 | 2,755,178 | 0.7 |
| 74 | Bergen, NJ | 1 | 1,438,034 | 0.7 |
| 75 | Los Angeles, CA | 10 | 14,134,907 | 0.7 |
| 76 | San Diego, CA | 7 | 11,400,611 | 0.6 |
| 77 | Ft. Worth, TX | 1 | 1,654,546 | 0.6 |
| 78 | Flint, MI | 1 | 1,706,146 | 0.6 |

| | Metro Area Name | Visitor suicides | Trips | Visitor suicides/ million trips |
|---|---|---|---|---|
| 79 | Providence, RI | 1 | 1,779,531 | 0.6 |
| 80 | Dallas, TX | 7 | 12,246,735 | 0.6 |
| 81 | Detroit, MI | 4 | 7,342,206 | 0.6 |
| 82 | Bakersfield, CA | 1 | 1,876,861 | 0.5 |
| 83 | Salinas, CA | 1 | 2,293,350 | 0.4 |
| 84 | Houston, TX | 5 | 11,539,586 | 0.4 |
| 85 | Sacramento, CA | 3 | 7,314,799 | 0.4 |
| 86 | Milwaukee, WI | 1 | 2,787,368 | 0.4 |
| 87 | Atlantic City, NJ | 2 | 6,302,910 | 0.3 |
| 88 | Columbus, OH | 2 | 6,738,819 | 0.3 |
| 89 | San Antonio, TX | 2 | 7,322,738 | 0.3 |
| 90 | Newark, NJ | 1 | 4,061,781 | 0.3 |
| 91 | Orlando, FL | 3 | 11,998,343 | 0.3 |
| 92 | Youngstown, OH | 0 | 779,675 | 0.0 |
| 93 | Saginaw, MI | 0 | 672,135 | 0.0 |
| 94 | Salem, OR | 0 | 337,760 | 0.0 |
| 95 | Modesto, CA | 0 | 341,526 | 0.0 |
| 96 | Peoria, IL | 0 | 771,528 | 0.0 |
| 97 | York, PA | 0 | 469,933 | 0.0 |
| 98 | Boulder, CO | 0 | 562,740 | 0.0 |
| 99 | Ann Arbor, MI | 0 | 1,146,798 | 0.0 |
| 100 | Akron, OH | 0 | 1,148,237 | 0.0 |
| 101 | Kalamazoo, MI | 0 | 1,192,108 | 0.0 |
| 102 | Reading, PA | 0 | 631,750 | 0.0 |
| 103 | McAllen, TX | 0 | 717,483 | 0.0 |
| 104 | Harrisburg, PA | 0 | 2,225,270 | 0.0 |
| 105 | Tacoma, WA | 0 | 784,977 | 0.0 |
| 106 | Huntsville, AL | 0 | 893,780 | 0.0 |
| 107 | Scranton, PA | 0 | 1,837,932 | 0.0 |
| 108 | Newburgh, NY | 0 | 942,939 | 0.0 |
| 109 | Fayetteville, NC | 0 | 953,018 | 0.0 |
| 110 | Monmouth, NJ | 0 | 2,569,688 | 0.0 |
| 111 | Fresno, CA | 0 | 1,364,048 | 0.0 |
| 112 | Ventura, CA | 0 | 1,729,063 | 0.0 |
| 113 | Sonoma, CA | 0 | 1,781,083 | 0.0 |
| 114 | Des Moines, IA | 0 | 1,834,949 | 0.0 |
| 115 | Ft. Myers, FL | 0 | 1,875,539 | 0.0 |
| 116 | Austin, TX | 0 | 3,867,992 | 0.0 |
| 117 | Santa Barbara, CA | 0 | 2,312,053 | 0.0 |
| 118 | Orange Cnty, CA | 0 | 4,040,876 | 0.0 |

Sources: National Center for Health Statistics, U.S. Mortality Detail File; U.S. Bureau of Transportation Statistics, 1995 American Travel Survey.

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