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The Relationship of Ecological and Geographic Factors to Gambling Behavior and Pathology

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The current study examined the effect of neighborhood disadvantage and gambling availability on gambling participation and pathology. A national telephone survey included 2631 US adults. Census data was used to characterize the respondent's neighborhood, and the distance from the respondent's home to gambling facilities was calculated. Logistic and linear regressions were performed to predict gambling participation and pathology. Results showed that the neighborhood disadvantage was positively related to frequency of gambling and problem/pathological gambling. The presence of a casino within 10 miles of the respondent's home was positively related to problem/pathological gambling. The permissiveness of gambling laws was positively related to any gambling in the past year, as well as frequent gambling. These results were interpreted to mean that the ecology of disadvantaged neighborhoods promotes gambling pathology, and that availability of gambling opportunities promotes gambling participation and pathology.

KEY WORDS: gambling; casino; availability; laws; neighborhood.

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INTRODUCTION

Social researchers have long recognized the importance of neighborhood ecological influences on problem behaviors such as criminal offending and substance abuse. For example, the classic work of Shaw and McKay (1969) positively related crime rates to what they termed ''neighborhood disorganization'' (Shoemaker, 2000). Shaw and McKay believed that in certain densely populated, economically depressed neighborhoods, the young people were influenced by cultural transmission of antisocial values and examples of economic success through crime. Recent research has connected neighborhood deterioration (residential mobility, single-parent households, vacant units, etc.) and disadvantage (families in poverty, unemployment, etc.) to adolescent violence, crime and substance abuse. (Boardman Finch, Ellison, Williams, & Jackson, 2001; Elliott, 1994; Paschall & Hubbard, 1998; Stiffman, Hodley-Ives, Elze, Johnson, & Dore, 1999). Boardman and his colleagues used tract-level census data to show a positive relationship between ''neighborhood disadvantage'' and individual drug use after controlling for individual socioeconomic status. Neighborhood disadvantage was based on percent of persons below the federally-defined poverty level, percent of households headed by a female, the unemployment rate, and the percentage of families on welfare. This result, and many similar results, shows a true ecological effect of neighborhood milieu on individual behavior.

Another perspective for understanding addictive behaviors is the public health model. In the alcohol field, for example, there has been a long-standing controversy between advocates of the public health model, who emphasize restricting the availability of alcohol for the entire society, and advocates of the disease model, who emphasize treatment and other measures for the especially vulnerable ''alcoholic'' part of the society. (Beauchamp, 1980; Cahalan, 1987).

Neighborhood Characteristics and Gambling

There are reasons to believe that neighborhood characteristics might be related to pathological gambling. The finding that pathological gamblers are disproportionately poor and disproportionately members of a minority group provides reason for suspecting neighborhood effects, because poor people and minority members are

often together in the same neighborhoods (Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001). However, empirical studies relating gambling to neighborhood characteristics are sparse. Nurco and associates demonstrated that subjects who observed illegal gambling in their childhood neighborhoods were more likely to become drug addicts, suggesting gambling as part of neighborhood pathology (Nurco, Kinlock, O'Grady, Lerner, & Hanlon, 1996). Weiss described research showing that gambling is more common in working class neighborhoods (Weiss, 1988). He placed gambling in a sub-cultural and neighborhood context when he described it as the working-class analogue of investing. Gambling has been found to be less prevalent in rural areas (Wallisch, 1993). This pattern may be parallel to the ''dry'' regions which national drinking surveys have found in the US In dry regions, social and religious conservatism influences drinking patterns (Midanik & Clark, 1994). Clotfelter and Cook, economists who study public policy issues, expressed their concern about the high density of lottery outlets in poor neighborhoods, and referred to the lottery as a ''regressive tax'' (Clotfelter & Cook, 1991).

Gambling and Availability

The National Council on Problem Gambling has advocated a public health perspective, pointing out that pathological gambling is more prevalent where gambling is more available, and advocating a national gambling policy to restrict the availability of gambling (National Council on Problem Gambling, 1993). In another example, Volberg (1994) writes, ''The proliferation of legalized gambling in the United States constitutes a public health issue because of the adverse effects that new forms of gambling can have on overall prevalence rates [of pathological gambling] as well as on at-risk groups in the general population''. In other words, Volberg reprises for gambling a theme often applied by the neo-prohibitionists to alcohol—when availability increases, average consumption goes up, and likewise the prevalence of adverse consequences. There is research to suggest that this is the case.

Studies Relating Gambling Pathology to the Legal Status of Gambling

Volberg (1994) showed a positive correlation between the number of types of legal gambling available in five states and lifetime

pathological and problem gambling rates from those states. Lester (1994) examined the relationship between the availability of legal gambling in the 50 states and the number of Gamblers Anonymous chapters, and found more Gamblers Anonymous chapters per capita in states with legal casinos and sports betting. In a recent statewide survey of adults conducted in Nevada, Volberg (2002a) found that Nevada had an estimated rate of 6.4% for current pathological/problem gamblers as measured by the South Oaks Gambling Screen (SOGS), higher than any of the 10 other states in which she has conducted surveys in recent years and in which the prevalence of pathological/problem gambling was also measured using the SOGS. However, comparison of Nevada versus the rest of the country is somewhat ambiguous. In the Volberg Nevada survey, another pathological gambling measure (the National Opinion Research Center (NORC) DSM Screen for Problem Gambling (NODS)) produced rates of 0.3% for current pathological gambling and 2.1% for lifetime pathological gambling. NORC's 1998 national survey (NORC, 1999) combining telephone and casino patron samples produced rates of 0.6% for current pathological gambling and 1.2% for lifetime pathological gambling. Therefore, according to the NODS figures, Nevada has a lower rate of current pathological gambling than the US Also, in a survey of adolescents, Volberg (2002b) found that young Nevadans did not have unusually high rates of pathological/problem gambling. Jacobs (2001) compared the 12-month any-gambling rates for adolescents in nine US states where lottery was legal with the rates from five states without a lottery. His results were not subjected to a test of statistical significance, and so are merely suggestive. Adolescents in lottery states had an average prevalence rate of 67%, while those in non-lottery states averaged 46%. Frank (1992) found that in states with the least restricted access to legal gambling, college student participation in gambling was greatest.

In addition to the studies that compare jurisdictions with different degrees of permissiveness in their gambling laws, there are also studies that contrast before-and-after change in the legal status of gambling. Emerson, Laundergan and Schaefer (1994) reported on surveys conducted in Minnesota in 1990 and 1994. Rates of pathological and problem gambling increased from 2.5% to 4.4%, coincident with the legalization of the lottery and a large increase in the number of casinos. The stage was set for an interesting natural experiment

when a court ordered video lottery machines in South Dakota to be temporarily shut down. Carr, Buchkoski, Kofoed, and Morgan (1996) documented that the number of persons treated in four outpatient programs for pathological gambling went from an average of 11 per month to one per month, then back to previous rates when the ban was lifted. Not all the studies have shown a positive relationship between gambling availability and gambling pathology. In a panel study of Minnesota adolescents, Winters, Stinchfield, Botzet, and Anderson (2002) found that rates of past-year gambling, regular gambling and pathological gambling were stable across an 8-year interval in the 1990s, in spite of the expansion of gambling opportunities in Minnesota.

Studies Relating Gambling Pathology to Physical Closeness of Gambling Opportunities

In a small number of studies, negative consequences of gambling have been shown to be related to geographic distance from gambling opportunities and ease of physical access to gambling. Researchers at the NORC combined data from a national telephone survey with data from a casino patron survey (NORC, 1999). They found that for adult respondents, living within 50 miles of a casino doubles their probability of pathological or problem gambling. They also conducted ''key respondent'' studies in nine communities where casinos had opened, and in seven cases there was an indication of increased problem gambling. Room (1999) conducted surveys in Niagara Falls, Ontario before and after the opening of a casino, and found increases in all 18 problem indicators of gambling. Not all the studies have shown a relationship between distance from gambling opportunities and the prevalence of gambling pathology. Govoni, Frisch, Rupcich, and Getty (1998) conducted a study similar to the Niagara Falls study around a Windsor, Ontario casino and failed to find an increase in the local rate of pathological gambling.

In the research presented below, we have addressed the relationship between several ecological factors (neighborhood characteristics, number of forms of legal gambling, and distance from gambling facilities) and gambling behavior and pathology. We have extended the existing body of research in several ways. We interviewed a representative sample of US adults. We have, by means of geocoding,

objectively calculated the respondent's distance from specific gambling facilities, and used census data to characterize the respondent's neighborhood.

METHODS

Design

We conducted a national random-digit-dial telephone survey with a representative sample of US residents aged 18 or older. The random-digit-dial sample was purchased from Survey Sampling Inc. of Fairfield, Connecticut. The telephone sample was selected randomly from a sampling frame of all working telephone blocks in the US. The sample was stratified by county and by telephone block within county. This resulted in a sample that was spread across the US proportionately by population, and not clustered by geographic area. The interviews were conducted by trained interviewers at the Research Institute on Addiction's Computer-Assisted Telephone Interviewing (CATI) facility.

A total of 14,700 telephone numbers were contacted. Each telephone number was called at least seven times to determine if that number was assigned to a household containing an eligible respondent. Once a household was designated as eligible, the number was called until an interview was obtained or refusal conversion had failed. The respondents were recruited by selecting randomly from the adults in each household by taking the adult with the most recent birthday.

Among the 14,700 numbers, 4338 were determined to be households with a resident aged 18 or older. Among these 4338, 302 contained selected respondents who were physically or mentally unable to be interviewed, leaving 4036 households known to contain a person eligible to be a respondent. There were 6870 numbers determined to not be households (e.g., businesses, data lines, nonassigned numbers). Adding the 302 unable to communicate to the 6870 results in 7172 households known to not be eligible. This results in $14{,}700 - 4036 - 7172 = 3492$ for which eligibility was not determined (e.g., repeated no answers or busy). From the 4036 eligible households, 2638 interviews were obtained. Dividing the number

of completed interviews by the number of households known to be eligible, yields a response rate of 2638/4036 = 65.4%. Another standard method of calculating response rate defined by the Council of American Survey Research Organizations requires assuming that the proportion of eligible to non-eligible households in the group for which eligibility was not determined is the same as among those for whom eligibility was determined. This means that there are an estimated (4036/(7172 + 4036)) (3492) = 1257 eligible households in the unknown group. Added to the 4036 known to be eligible, this gives us 5293 eligible households from which 2638 interviews were obtained. The resulting response rate, therefore, was 2638/5293 = 49.8%.

The 2638 telephone interviews were conducted from August 1999 through October 2000. The survey was in the field for approximately a year, to capture a representative sample of possible seasonal effects, and to allow the use of a smaller but highly trained and carefully supervised crew of interviewers. Interviews were conducted in all 50 states plus the District of Columbia.

Results were statistically weighted to compensate for the number of potential respondents in the household. Weighting adjustments were also used to align the sample with gender, age, and race distributions shown in the US census estimates for the year 2000. Males, Hispanics, Asians, and older respondents were ''weighted up''. The weighted distributions of the sample, according to region, gender, race and age, closely match the US population.

Measures Derived from the Interview

Our measure of ''socioeconomic status'' was based on the mean of three equally weighted factors: family income, years of education, and occupational prestige. When one of these factors was absent (as with a non-working respondent), the mean of the two existing factors was used. Occupational prestige was coded from census occupation categories using the method of Duncan updated. ''Gambling frequency'' was measured with 15 sets of questions, corresponding to the 15 types of gambling (e.g., lottery, pulltabs, sports betting). For each type, the respondents were asked if they had participated in that type of gambling in the past year. If they responded affirmatively, they were asked how frequently they had participated in that

type of gambling in the past year. There were eight response options for the frequency questions, ranging from ''every day'' to ''never in the past 12 months''. These choices were recoded to estimated number of times per year (e.g., ''every day'' became 365), and summed across the 15 types. Our measure of ''pathological or problem gambling'' was the Diagnostic Interview Schedule (DIS) for the American Psychiatric Association's Diagnostic and Statistical Manual, Version IV (DSM-IV) (Robins, Marcus, Reich, Cunningham, & Gallagher, 1996). The DIS for pathological gambling contains 13 items that map into 10 criteria, such as preoccupation with gambling and needing to gamble with increasing amounts of money to get the same excitement. Endorsement of five or more criteria is considered pathological gambling, and for our purposes we considered endorsement of three or more criteria to be problem gambling. Five or more symptoms are endorsed by fewer than 2% of respondents, and therefore might not provide enough people in the pathological category for a stable logistic analysis. However, it is possible to have one symptom of pathological gambling as a fluke, but three is enough to assure the presence of a true gambling problem. Respondents who endorsed the requisite number of items for the past year were considered to be current pathological or problem gamblers.

Geographic Measures

In addition to the variables that were based on the data from the interview, the current analyses used several geographic variables. Each respondent's address was obtained during the interview. The addresses of several types of gambling establishments were obtained from Outcalt & Associates (Outcalt, 2000). These types of establishments were: Indian casinos, non-Indian casinos, embarkation points of riverboat casinos, card rooms, dog tracks, harness racing tracks, quarterhorse tracks, ordinary horse tracks, and jai alai frontons. Each respondent's address and the gambling facility addresses were converted to map coordinates (geocoded to provide latitude and longitude) by Etak, a company specializing in digital mapping. All addresses were matched to street address, city, state, and zip code. The requirement that all of the multiple zones in the address be matched correctly minimizes the possibility of geocoding error. In addition to these requirements, selected locations were also verified.

This coordinate data information was used by the Center for Health and Social Research (State University College at Buffalo) to match the locations with tract and block group 1990 census data. The census data were attached to each respondent's data file. The coordinate data were used to compute a set of proximity-to-gambling variables for each respondent. These proximity variables included radius variables (e.g., ''number of casinos within 10 miles'') and nearest distance variables(e.g., ''distance to the nearest card room''). To ensure the accurate measurement of distances, these distance variables were computed using an equidistant conic projection.

''Neighborhood disadvantage'' was measured using a method that has been used in other studies (Boardman et al., 2001). Data from each respondent's census block group was attached to his or her case. (The average population of these block groups was 1765.) The block-level variables used to make the disadvantage scale were: (1) percentage of households on public assistance, (2) percentage of families headed by a female, (3) the percentage of adults unemployed, and (4) the percentage of persons in poverty. These percentages were standardized and averaged with equal weights. A measure of the percentage of persons that were urban (''block percent persons urban'') was also computed for each respondent's block group. The US census defined ''urban'' as living in places of 2500 or more which are incorporated as cities, boroughs, etc. Each respondent lived in a distinct block group, so these variables were independent across respondents. In addition to the proximity and census data, information was also compiled on the legality of various forms of gambling in each state. Our primary source for this information was the ''Gambling and the Law'' website (www.gamblingandthelaw.com) maintained by I. Nelson Rose. Rose is an expert on the subject of state gambling laws and frequently updates his website to reflect changes in those laws. We also consulted the gambling statutes database constructed by the National Gambling Impact Study Commission (NGIC, 1999).

The specific geographic variables used in the current analyses are described below. The measure of ''permissiveness of state gambling laws'' was the number of types of gambling that were legal in the respondent's state, from among these types: lottery, bingo, dog tracks, horse tracks, card rooms, charity casinos, Indian gaming casinos, and non-Indian commercial casinos. The values of this scale

ranged from 0 to 6. The value of this variable was the same for all respondents living in a given state. Whether or not the respondents home was within 10 miles of a casino (a 0,1 variable) was also used in the current analysis.

RESULTS

Screening the Potential Independent Variables

First, we conducted screening analyses to reduce the potential independent variables to a manageable number. The study contained a large number of variables that reflected the availability of various gambling facilities to the respondent's home. These facilities included casinos, card rooms, and horse or dog tracks. For each of these types of facilities, variables were available that reflected the distance from the respondent's home to the nearest facility, the number within 10 miles of the respondent's home, the number from 10 to 50 miles of the respondent's home, and so on for 50–100 miles, 100–150 miles, and 150–250 miles. (For the nearest distance measures, log transformations were used because untransformed distance had virtually no correlations with gambling variables.) To reduce the number of independent variables, we used them all as predictors in three logistic regressions. The dependent variables for these regressions were: (1) any gambling in the past year, (2) frequent gambling, meaning that the respondent gambled as often as twice per week in the past year, and (3) pathological or problem gambling, meaning that the respondent had three or more symptoms of pathological gambling in the past year. All the predictors were entered into the model, and then backward elimination was performed until only those independent variables that were statistically significant at the 0.01 level remained. The surviving variables were the number of casinos within 10 miles and the number of card rooms within 10 miles. The screening of these availability variables was also run without the data from Hawaii and Alaska, with very similar results. These two variables were used as predictors in initial versions of our main analyses. We subsequently dropped the variable reflecting the number of card rooms within 10 miles because it was not significant in any subsequent analyses. We recoded the number of casinos within 10 miles

into a dichotomous variable reflecting ''whether or not the respondent lived within 10 miles of a casino''. We did this because an exploratory analysis showed that the rate of pathological gambling among those 194 respondents with 1 or 2 casinos within 10 miles of their home was almost identical to those 93 respondents who had from 3 to 161 casinos within 10 miles of their home. This dichotomous variable was used as a predictor in subsequent analyses.

The same procedure was used to screen a group of block-level census variables that included neighborhood disadvantage as well as percent of persons foreign born, percent of households speaking a language other than English, and a few variables that reflected the socioeconomic status of the census block group, such as the percent of workers who were professional or managerial. Neighborhood disadvantage was the only variable that survived the backwards elimination.

Main Analyses

Our primary analyses were two logistic regressions and a linear regression. We conducted exploratory analyses with Bryk and Raudenbush's HLM software package, using hierarchical models because our ''state law permissiveness'' variable is defined at the state level, while all the other variables in these analyses are defined at the individual level (Bryk & Raudenbush, 1992). These exploratory HLM analyses, which were unweighted because HLM does not allow weights, produced virtually identical results to unweighted analyses done with conventional SPSS software. Because this comparison of otherwise similar HLM and non-HLM analyses showed HLM to be unnecessary, there was no reason to forgo the benefit of weighting. We have presented the weighted SPSS analyses here. References to *N*s in the text, tables and figures are unweighted; all else is weighted.

Tables 1 and 2 show the results of two logistic regressions and a linear regression, predicting past-year gambling (whether or not), and current pathological or problem gambling, and frequency of gambling (i.e., number of times gambled in the past year). In our sample, 82.2% gambled in the past year, and 3.5% were problem or pathological gamblers. Our respondents gambled an average of 49 times in the past year. The independent variables of primary interest are neighborhood disadvantage (the best predictor to emerge from

Table 1
Logistic Regressions

	Dependent Variable			
	Past Year Gambling (Yes/No)		*Problem or Pathological Gambling (Yes/No)*	
Independent Variable	*OR*	*95% Conf*	*OR*	*95% Conf*
SES	1.08*	1.02, 1.16	0.83*	0.71, 0.98
Block percent persons urban	1.00	1.00, 1.00	1.01	1.00, 1.01
Black (yes/no)	0.60***	0.43, 0.81	1.52	0.84, 2.74
Hispanic (yes/no)	0.91	0.65, 1.28	2.22**	1.29, 3.83
Neighborhood disadvantage	1.13	0.99, 1.29	1.69***	1.41, 2.01
Casinos within 10 miles (yes/no)	0.96	0.69, 1.34	1.90*	1.11, 3.24
Number of types of legal gambling	1.17***	1.09, 1.25	0.93	0.80, 1.08

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Unweighted $N = 2630$.
OR, odds ratio.

Table 2
Regression of Number of Times Gambled in Past Year

Independent Variable	*B*	*95% Conf*
SES	−2.19	−4.48, 0.09
Block percent persons urban	0.05	−0.04, 0.14
Black (yes/no)	20.53***	8.03, 33.02
Hispanic (yes/no)	2.05	−10.17, 14.28
Neighborhood disadvantage	7.88***	3.12, 12.64
Casino within 10 miles (yes/no)	−9.36	−21.32, 2.60
Number of types of legal gambling	5.64***	2.92, 8.36

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Unweighted $N = 2630$.

the screening of neighborhood variables), whether or not there was a casino within 10 miles of the respondent's home (the best predictor to emerge from the screening of the gambling availability variables), and the permissiveness of state gambling laws. The ''block percent persons urban'' and the individual respondent's socioeconomic status and race (Black and Hispanic dummy variables) are included as controls to assure that any effect attributed to the primary independent variables is not a spurious result of a correlation with social class, race, or living in a city. The overall predictive power of these three models is quite modest. The *R*-square for the linear regression predicting frequency of gambling (Table 2) is 0.022. The Cox & Snell *R*-squares for the logistic regressions predicting past-year gambling and problem/pathological gambling are 0.029 and 0.13, respectively. Clearly, there are many important influences on gambling pathology and behavior that are not considered in these ecological models.

Neighborhood disadvantage shows no effect on past year gambling, but it has a strong positive effect on frequency of gambling and pathological or problem gambling. The odds ratio of 1.69 (Table 1) shows that for every increase of one standard deviation in neighborhood disadvantage, the odds of being a pathological or problem gambler increase by 69%. The coefficient of 7.88 (Table 2) shows that, for every increase of one standard deviation in neighborhood disadvantage, the respondent gambles approximately eight

additional times per year. A casino within 10 miles of home has a significant effect on pathological or problem gambling, and the odds ratio of 1.9 (Table 1) shows that a casino within 10 miles of home is associated with a 90% increase in the odds of being a pathological or problem gambler. The permissiveness of state gambling laws had an effect on past year gambling and frequency of gambling, but no effect on pathological or problem gambling. The odds ratio of 1.17 (Table 1) demonstrates that for every additional form of legal gambling in his or her state, the respondent's odds of having gambled in the past year increase by 17%. The coefficient of 5.64 (Table 2) shows that for every additional form of legal gambling in his or her state, the respondent gambles approximately six additional times per year.

Figures 1–3 help to quantify the relationships discovered in the regressions. The left panel of Figure 1 shows that respondents who live in the 10% most disadvantaged neighborhoods have 12 times the rate of pathological or problem gambling (10.0%) as those who live in the 10% least disadvantaged neighborhoods (0.8%). The right panel of Figure 1 shows that the frequency of gambling in the 10% most disadvantaged neighborhoods (72 times/year) is more than

Figure 1
Gambling involvement by neighborhood disadvantage.

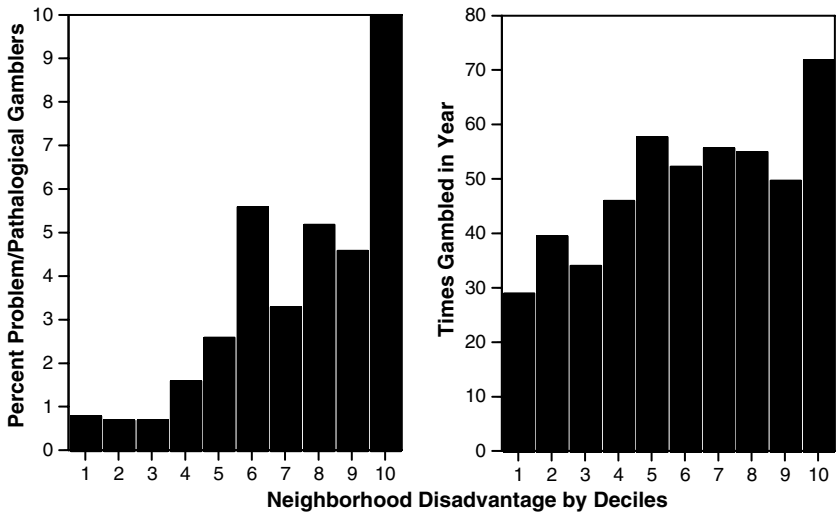
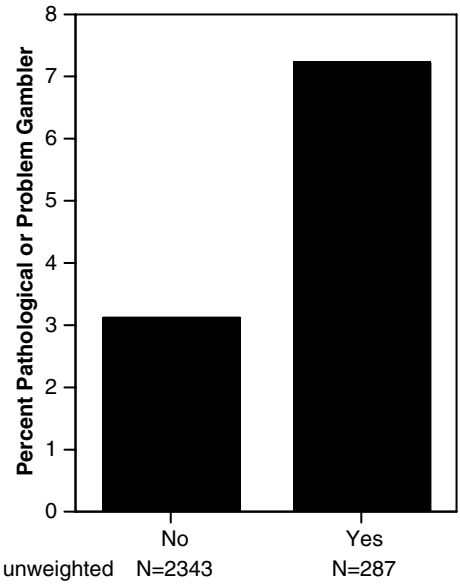


Figure 2
Pathological/problem gambler by casino within 10 miles.

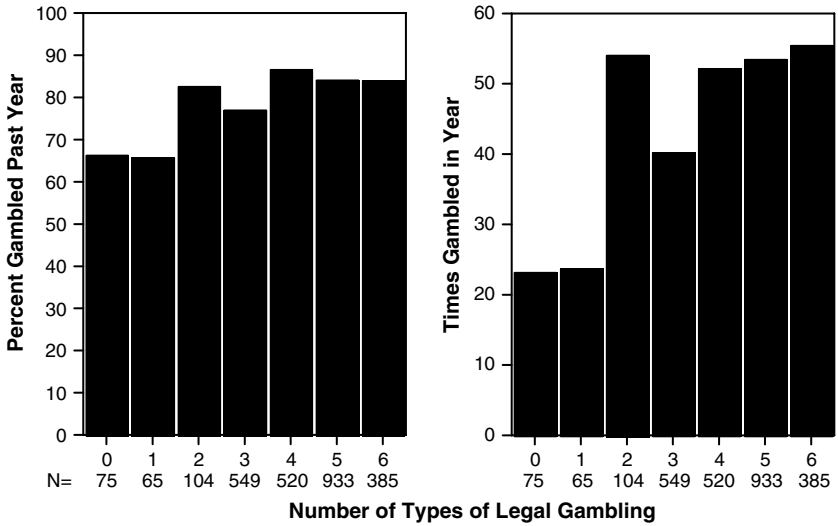


twice the frequency in the least disadvantaged decile (29 times/year). Figure 2 shows that respondents who live within 10 miles of a casino have more than double the rate of pathological or problem gambling of those who do not (7.2% vs. 3.1%). The left panel of Figure 3 shows that for states with zero or one form of legal gambling, the prevalence of having gambled in the past year (66%) is lower than in states with two through six forms of legal gambling (77%–87% range). The right panel shows that for states with zero or one form of legal gambling, the average number of times gambled in the past year (23 times) is lower than in states with two through six forms of legal gambling (40–55 times).

DISCUSSION

A strong effect of neighborhood disadvantage on pathological gambling was found. Respondents in disadvantaged neighborhoods have much higher rates of pathological or problem gambling than

Figure 3
Gambling involvement by number of types of legal gambling.



those who do not live in disadvantaged neighborhoods. There are a variety of possible explanations for this phenomenon. Since we have controlled for the individual respondent's socioeconomic status, we know that this is not simply an effect of poverty at the individual level. It must be acknowledged that some of the problem gamblers interviewed in our study might have been forced to move to disadvantaged neighborhoods by financial setbacks. However, the trend shown in Figure 1 is sufficiently large that it seems likely that there is some environmental influence in disadvantaged neighborhoods that encourages gambling. As mentioned earlier, the National Gambling Impact Study Commission found lottery outlets to be more common in poor neighborhoods (NGIC, 1999). In a classic study of neighborhood ecology applied to alcohol, Donnelly found that household density was positively related to several negative consequences of alcohol, including rates of deaths from cirrhosis and rates of alcohol-related arrests (Donnelly, 1978). One explanation advanced for this phenomenon was that high density (and generally poorer) neighborhoods provided more drinking companions. A parallel explanation might also apply to gambling.

These results show possible influences of gambling availability on the prevalence of pathological or problem gambling among US adults. Those who live within 10 miles of a casino have twice the rate of pathological or problem gambling as those who do not. The most straightforward explanation for this relationship is that the availability of an attractive gambling opportunity can lead to gambling pathology in some people who would not otherwise develop it. There are, of course, other possible explanations. A few addicted gamblers might move to get closer to the casino. Our analysis has eliminated some possible ''third variable'' explanations. For example, we have controlled for urban place of residence, so we know that the geographic effects on gambling that we have observed do not exist because both pathological gamblers and casinos tend to be located in cities. There are always, however, possible confounding variables that have not been measured. Nonetheless, we argue that consideration must be given to the possibility that a nearby casino is a contributing cause to some pathological or problem gambling. As mentioned earlier, the NORC national gambling survey showed that respondents who lived within 50 miles of a casino had double the chance of being problem gamblers. The NORC study did not contain the necessary data for a finer determination. However, thanks to our use of a geographic information system, we were able to determine (see the Section ''Variable Screening'') that this influence may only extend to 10 miles. However, we cannot conclude that we understand this issue based on two studies which made many measurements differently.

Some effect of the permissiveness of state gambling laws was also found. Past-year gambling was more common in states with two or more forms of legal gambling, and the average number of times gambled per year was also higher in those states with more forms of legal gambling (Figure 3). These effects were significant in the logistic and linear regressions even with proximity of casinos controlled. It is again obligatory to mention a caveat—those states that already have a more libertine culture might be quicker to legalize various forms of gambling. Utah, one of the states with no legalized gambling, might have low gambling participation even with more permissive laws. It is also interesting to note that the permissiveness of state gambling laws has no relationship to the prevalence of problem/pathological gambling. (This is not because casino availability is con-

trolled. An exploratory analyses, not mentioned elsewhere in this paper, showed the same result even in a logistic regression in which permissiveness is the only predictor variable). This may be because many states have liberalized their gambling laws recently, and gambling behavior is more quickly changed than gambling pathology. It may also be because state-to-state variations in the prevalence of gambling pathology are influenced by state-to-state variations in the prevalence of predisposing factors, which submerge the effect of legal availability.

It is important to place these results in perspective. Individual traits have a stronger relationship to gambling pathology than geographic factors. For example, in another analysis of this same survey, we found a strong relationship between individual problem gambling and alcohol abuse or dependence (Barnes, Welte, Hoffman, & Dintcheff, 2002). An individual's substance involvement tells us more about his likelihood of gambling pathology than any geographic factor. However, social and environmental influences on gambling behavior and pathology are interesting in themselves, and have a special relevance to public policy debates around the US in recent years. Because localities can control the location and density of gambling opportunities, such as casinos or lottery outlets, policy makers can have some influence over the rates of problem gambling in our society.

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