JOURNAL OF GAMBLING ISSUES

opinion

Clarifying the at-risk label: A commentary

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Abstract

The at-risk concept is described and its use in the literature on pathological gambling is discussed. An epidemiologic perspective is proposed and the use of *risk*, *at-risk*, and *not-at-risk* are discussed within this framework. It is shown that within the epidemiologic framework the concept of risk applies to nongamblers as well as gamblers, and some nongamblers are theoretically at risk. An example of the application of risk is provided within the context of smoking and the meaning of risk. The frequent assignment of gamblers with scores of 1 or 2 into the same category as those who score 0 is viewed as problematic and is discussed in terms of true negatives and false negatives and the likelihood of pathological gambling among these gamblers. The need for researchers to identify the determinants and indicators of risk is stressed. **Key words**: risk, at-risk, not-at-risk, false negatives, true negatives, severity, symptom assessment, nongamblers

Appearances to the mind are of four kinds.
Things either are what they appear to be; [true positives][1]
or they neither are, nor appear to be; [true negatives]
or they are, and do not appear to be; [false negatives]
or they are not, yet appear to be. [false positives]

Rightly to aim in all these cases is the wise man's task.

Epictetus, 2nd century A.D.[2]

Introduction

The use by researchers in a number of disciplines of the term *at risk* has a long history and recent times have seen a resurgence of this usage in the medical, economic, psychological, and

educational literature (Schonert-Reichl, 2000). This is true for the study of pathological gambling as well, with the added dimension of hyphenation, that is, *at-risk* (Shaffer & Kidman, 2004).

The concept of *at risk* when applied to public health and mental health clearly takes on its strongest meaning in the context of prevention (Derevensky, Gupta, & Dickson, 2004). Its meaning in the study of pathological gambling has rarely been within this prevention context; more frequently it has been applied in the context of prognosis or natural history (Winters, Stinchfield, Botzet, & Anderson, 2002).

Risk refers to something that will occur in the future and *at risk* essentially implies that those so labeled are more likely than others to experience the event, for example, the onset of pathological gambling. The general meaning of the term at *risk* is to refer to someone who is likely to encounter serious problems at some future date conditional on the presence or absence of theorized or empirically validated risk and protective factors and their interaction (Messerlian, Derevensky, & Gupta, 2005). Risk factors and protective factors are two sides of the same coin with respect to risk. Risk factors increase risk, whereas protective factors reduce risk. The origins of the term *at risk* are unclear, but at least in medicine its roots can be traced to epidemiologic practice (Garmezy, 1994).

Its use in the gambling literature has often been ambiguous and simply wrong at worst. Even when used properly, its justification is weak; typically the application of at-risk is based on score levels. In general, the *at-risk* label has been applied to those gamblers who score positive on one or more symptoms but fail to meet the criterion for classification as pathological gamblers. As an aside, a number of other categorical labels have been applied to this class of gamblers as well. These include, among others, potential pathological, problem, subclinical, in transition, and level-two gamblers. The use of these varied labels has generated some confusion in the literature (Shaffer & Kidman, 2004), but only a few investigators have attempted a systematic criticism or attempted to resolve the issue (Ferris, Wynne, & Single, 1999; National Research Council, 1999; NORC, 1999).

The predominant view of at-risk gambling, at least among adolescents, was perhaps best expressed by Winters et al. (2002). This view holds that those labeled at-risk are less seriously disordered than those at or above the cutoff score, but are at increased risk, relative to those who score 0, of developing a more serious problem (Winters et al., 2002). The latter view assumes that increasing scores represent increasing levels of severity.

Although this view has some merit (Gambino, 2005), it is

insufficient to explain which of those gamblers who score in this range will make the predicted transition from less seriously to more seriously disordered. Further, it ignores the distinction between symptom assessment and the severity dimension itself (Finlayson, Moyer, & Sonnad, 2004). It further implies that the number of symptoms is a straightforward measure of severity, an implication that may not be true. All symptoms, for example, are not equal in severity (Toce-Gerstein, Gerstein, & Volberg, 2003), and severity is not always reflected in the emergence of symptomology (Finlayson et al., 2004).

A more literal interpretation of *at-risk* is that those individuals so labeled are not pathological gamblers at the time of testing but might become so in the future. This interpretation that at-risk gamblers are not pathological gamblers fails to recognize that some gamblers among those labeled at-risk may be false negatives. The four outcomes of testing for the presence or absence of pathological gambling are true positives, true negatives, false negatives, and false positives. The terms *positive* and *negative* by convention refer to meeting or not meeting the criterion score for designating a gambler as pathological or not.

Not meeting criteria is not equivalent to not being a pathological gambler at the time of testing; some pathological gamblers will be missed by setting a cutoff criterion (false negatives). Conversely, meeting criteria is not equivalent to being a pathological gambler; some gamblers who are free of the disorder but score at or above the cutoff will be falsely identified as pathological (false positives).

The decision not to count those who do not meet some arbitrary cutoff score as cases merely represents an analytical choice of convenience (Robins, 1985) and, in fact, raises the question of reporting these at all. One reason is the assumption that these individuals are at risk. This raises a second question: why are they at risk, or, put another way, what has placed these gamblers at risk for progressing to more serious problems or to the status of pathological gambler? A reference to scores alone is insufficient to make the case; additional information is needed.

This additional information requires the identification of those indicators of risk that predict movement between being pathological and not pathological. A common-sense view suggests that to state that someone is at risk implies the further statement that the individual is at risk because of something that places them at risk, for example, parental gambling history (Gambino, Fitzgerald, Shaffer, Renner, & Courtnage, 1993; Winters et al., 2002). Finally, the use of the at-risk label has resulted in the misleading practice of labeling nongamblers as not-at-risk.

Risk as an epidemiologic concept

One approach to clarifying the concept of *at-risk* is to adopt an epidemiologic framework. From this perspective, everyone is at risk for becoming a pathological gambler over the course of a lifetime, including nongamblers. To understand this, recall that risk refers to future events and takes on meaning only in the context of an implied or specified time-line; for example, what is the 1-year, 5-year, . . . … lifetime risk of becoming a pathological gambler? Or, what is the risk of becoming a pathological gambler following the initiation of gambling? It might also be asked what the risk is of a nongambler beginning to gamble.

Drawing upon the epidemiologic literature, risk when applied to the onset of pathological gambling is defined as the average probability of becoming a pathological gambler during a specified interval of time: the period of risk (Schlesselman, 1982). In this sense, risk is inherently a theoretical measure of incidence, where the latter may be defined as the rate of onset of pathological gambling among specified classes of individuals (Miettinen, 1985).

The epidemiologic concept of risk as it is mathematically defined states that risk is represented as a probability such that $0 \leq R^t \leq 1.0$, where R refers to risk and the superscript t represents the measured time period. Employing this definition of risk, everyone is at risk even if that risk can be shown to equal zero as, for example, in the case of gender-specific disorders (Rothman & Greenland, 1998).

In the epidemiologic context, not-at-risk is equivalent to the statement that risk equals zero for this class of individuals (Schlesselman, 1982). It is only in the sense that risk equals zero that the application of not-at-risk to nongamblers is meaningful, but this is rarely, if ever, spelled out. At risk, on the other hand, is defined as a risk greater than zero and, when defined relative to a class of individuals with a low risk, it signifies being at higher risk.

The current assertion that nongamblers are not at risk is not a valid statement in the absence of supportive evidence that relates this class of individuals to the determinants of pathological gambling and an associated time-line. Although nongamblers may be at zero risk of becoming pathological gamblers at the time of testing, it cannot be assumed that they remain at zero risk for becoming pathological gamblers in the absence of a specified future time-line. For example, at least one study has found, using a retrospective measure that the risk of pathological gambling among a sample of nongamblers remained at zero after a period of 5 years (British Columbia, 2003). Additional data of this form are necessary to firm up the relationship between being a nongambler and being at risk

for (a) starting to gamble and (b) becoming a pathological gambler after the onset of gambling.

A second example illustrates the importance of the time-line. Someone who is a nongambler at the time of testing (risk = zero) might later receive a gift certificate for scratch tickets and begin gambling the next day (risk ≥ zero). The goal of the researcher is to quantify risks for eligible populations, for example, classes of individuals who at the start of a study do not display any signs or symptoms of pathological gambling.

The epidemiologic task is to assign a probability value that defines the likelihood of becoming a pathological gambler during the interval of time under study. To repeat, from the perspective of the epidemiologist, to state that individuals in a particular group are at-risk simply implies that the risk of becoming a pathological gambler is greater than zero (Miettinen, 1985). Conversely, to state that a class of individuals such as nongamblers is not-at-risk is to imply that the individual risk among this class is zero.

The relevant issues associated with the use of the risk concept as applied to nongamblers can be illustrated with a common example. Smokers are at risk for developing a number of disorders (including pathological gambling). This does not imply that nonsmokers are not at risk! It merely signifies that smokers are at higher risk than nonsmokers for those disorders for which there is an established empirical association with smoking.

It also implies that if the nonsmoker (nongambler) takes up smoking (gambling), then that individual's risk for developing a disorder will increase accordingly. Similar notions apply to the situation where the smoker stops smoking, and by extension to the gambler who quits gambling. The risk associated with those individuals who quit smoking would then be adjusted downward on the basis of the relevant variables such as age at cessation, years of smoking, frequency of smoking, intensity of smoking (inhale deeply, inhale lightly), and so on.

The application of the smoking versus nonsmoking analogy to gambling simply states that with the onset of gambling, the individual may move from one level of risk (zero) to another (≥ zero). It remains an open question whether the onset of gambling is a risk factor in the sense attributed to smoking. In fact, this is unlikely to be the case and highlights the distinction between the epidemiologic term *risk factor*, suggesting a causal connection, and the more general epidemiologic term *risk indicator*, which refers to any attribute associated with higher risk (Miettinen, 1985). Alternatively, gambling certainly qualifies as a determinant of risk as this term is used by epidemiologists. In modern epidemiology, "a determinant is any factor that affects an outcome — not only the

agent of change but all contributors to outcome . . . " (Susser, 1991, p. 637). Clearly, in the absence of exposure to gambling, pathological gambling will not occur and risk will equal zero during the interval of time under observation.

This is why epidemiologists argue that a more meaningful use of the concept of risk occurs only when it is associated with identifiable indicators of risk and an interval of time (Rothman & Greenland, 1998). What is needed is the ability to make valid statements of the form: gamblers who wager on slot machines have a *P*% greater risk of becoming pathological gamblers in the next *T* years than those who gamble on scratch cards, where *P* lies in the interval between zero and 100 percent; the use of percent terminology (rather than probability) is a convenient and readily understood convention for expressing risk (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001).

It is also not difficult to show that the application of the at-risk label on the basis of score levels is inappropriate if it is meant to denote those who are not pathological gamblers simply because these gamblers did not meet the criteria. The general practice is to assign the at-risk label to those gamblers who score between 1 and 4; this is often limited further to those who score 3 or 4. To understand why this is inappropriate, it need only be recognized that it is possible to set a criterion of 1 to define cases of pathological gambling!

Note that the selection of scores of 1 as the cutoff does not imply that these gamblers are pathological gamblers. This choice relative to conventional cutoff scores of, for example, 5 or higher, simply implies that the likelihood of false positives is enhanced while the likelihood of false negatives is decreased. It should also be noted that the at-risk assertion as generally used implies that conventional cutoff criteria have a degree of diagnostic certainty that is clearly undeserved (Gambino, 2005).

There are two major weaknesses in the use of cutoff scores in prevalence studies of the general population. The first has been the failure to address the critical question of whether cutoff criteria based on current conventions are related to the clinical significance of the symptomology exhibited by those gamblers who meet the criteria (Kessler, 2002). This reflects in large measure the lack of effort to define the concept of clinical significance (Gambino, 2005) in the context of pathological gambling.

The second is the related failure to examine the association between specific cut-points and clinically relevant outcomes (Clarke & McKenzie, 1994). There has been little effort to date to relate cutoff criteria to meaningful decisions such as to treat or not to treat; the referral of screening outcomes for more intensive

testing; or the allocation of scarce resources for treatment, education, or prevention (Gambino, 2005; Jenkins, 2003).

The missing pathological gambler

One problem that deserves to be highlighted is the current practice in which gamblers with scores of 1 or 2 are generally lumped together with those who score 0. Shaffer and Hall (1996) noted this problem in their analysis of adolescent prevalence rates. These investigators argued properly that it is important to distinguish between symptom-free and symptomatic gamblers. Additionally, those who score 1 or 2 are often labeled as not-at-risk along with those who score 0 or those who report they have never gambled. These three groups are often placed in the same category. This represents a significant loss of information and in the case of those who score between 1 and 2 permits a demonstration of the misuse of the not-at-risk terminology.

It is well established in the medical literature that it is often the case that a single clinical sign or symptom may be a more powerful indicator of the presence of the disorder than the test as a whole (Kendell, 1989; Koch, Capurso, & Llewelyn, 1995). It is unclear at present whether such potent indicators of pathological gambling will occur frequently or at all among this class of gamblers. This requires an evaluation of individual items and their distribution among those who score 1 or 2 on the instrument employed in any specific study.

The argument that a score of 1 or 2 may reflect the presence of pathological gambling is not without empirical merit. A recent study has begun examining the distribution of clinical indicators among those who endorse one or more items and clearly demonstrates the importance of this task. Toce-Gerstein et al. (2003) analyzed the distribution of scores on the DSM-IV and reported that among those who scored 1 or 2, chasing was the most endorsed item. The latter characteristic is considered to be one of the more significant attributes of the pathological gambler (American Psychiatric Association, 1994; Lesieur, 1984; O'Conner & Dickerson, 2003).

A similar analysis has not been conducted for the most popular instrument employed to measure pathological gambling, the South Oaks Gambling Screen (SOGS) (Shaffer, Hall, & Vanderbilt, 1997), but available data indicate that comparable results may be found. For example, the results of a national prevalence study in Australia revealed that among those who scored 1 or 2 on the SOGS (Tremayne, Masterman-Smith, & McMillen, 2001), the most frequent items endorsed were "gambling more than intended" (20.7%) and "felt guilty about gambling" (5.8%). Chasing as defined by the SOGS, however, was endorsed by only 1% of

those who scored 1 or 2, a proportion it should be noted that is roughly equivalent to the average prevalence rates for pathological gambling among adults obtained in the U.S. and abroad (Shaffer, LaBrie, LaPlante, Nelson, & Stanton, 2004).

Analysis of these items by the present author using the likelihood ratio (*LR*) is revealing (Gambino, 2005). The *LR* is defined as sensitivity/(1 − specificity). Sensitivity (the true positive rate of the test) was estimated by the proportion of gamblers who scored 10 or higher and endorsed the specific item, while (1 − specificity) (the false positive rate) was estimated by the proportion who scored 1 or 2 and endorsed the item. This procedure for estimating the true positive and false positive rates to obtain sensitivity and specificity follows a common method of generating empirical estimates of these parameters (Zhou, Obuchowski, & McClish, 2002).

The results from estimating the *LR* reveal that the first item is weakly associated with meeting a strict (minimizing false positives) criterion of 10 (TPR = 100%, FPR = 20.7%, *LR* = 4.8), whereas the second item is strongly related (TPR = 100%, FPR = 5.8%, *LR* = 17.2). The *LR* for chasing was estimated at 66.7 (TPR = 66.7%, FPR = 1.0%), indicating a very strong relationship. According to interpretative guidelines provided by Jaeschke, Guyatt, and Sackett (1994), an *LR* that falls in the range of 2 to 5 represents a small, although sometimes important, association, whereas an *LR* greater than 10 is considered large and often conclusive. These results emphasize that it is a mistake to assume that individuals who score 1 or 2 are equivalent to those who score 0. It should be noted that this method is equivalent to correlating test items with the total test score.

The question of whether those who score between 1 and the cutoff score are at risk for developing more serious problems is not a straightforward proposition, since some gamblers will exhibit fewer symptoms over time (Shaffer & Hall, 2002). The weakness in this assertion lies in the failure to clearly specify the determinants of risk associated with changes in scores over time, as Winters et al. (2002) demonstrated. Which indicators of risk are associated with increasing symptoms and which are associated with decreasing symptoms is an important issue that cannot be resolved on the basis of the evidence to date. In fact, the establishment of validated risk and protective factors would help to clarify the current reliance on score levels to indicate individuals at risk. It should be apparent, for example, that if risk indicators are identified, then some proportion of those who score 0 must be at higher risk than the remaining gamblers in this class who lack the identified attributes of risk, and in theory at least could be at higher risk than some of those who score 1 or 2.

Categorical labels

There is a lack of strong evidence and theoretical rationales for applying different labels: problem versus pathological, level 2 versus level 3, probable versus potential, subclinical versus clinical, or not-at-risk versus at-risk. The basis for these labels appears not to reflect relationships that are consistently supported but rather what is intuitively appealing or a historical uncritical acceptance of the terminology found in the literature. On balance such labels should be abandoned since their continued use gives them a scientific legitimacy that is generally undeserved (Cox, Kwong, Michaud, & Enns, 2000).

For one thing, each of these labels implies incorrectly that these are qualitatively different individuals with respect to being or not being a pathological gambler. This is not a valid statement since, in the absence of additional evidence; it cannot be shown that, for example, a gambler who scored just above and a gambler who scored just below an arbitrary criterion score such as 5 are, in fact, different with respect to being or not being pathological gamblers (Robins, 1985). This can be generalized to the selection of any cutoff score as the criterion for defining a case.

In technical terms, acceptance of the construct of pathological gambling implies the two gamblers described in the above illustration represent, respectively, one of four possible combinations of states. These are (1) true positive, false negative (both pathological); (2) false positive, true negative (neither pathological); (3) true positive, true negative (the first pathological but not the second); or (4) false positive, false negative (the second pathological but not the first).

This description technically applies to the entire population, including nongamblers (who may be less than honest in responding) and those in treatment (who may be misdiagnosed). The selection of a criterion cutoff then determines the possible labels; that is those at or above can only be true positives or false positives. Those below the criterion can only be true negatives or false negatives.

This, of course, leaves unanswered such important questions as whether those at the lower score levels who are indeed pathological gamblers represent cases that are serious enough to warrant additional attention such as being the target of screening programs (Shaffer & Kidman, 2004). This is an important issue since the screening of large numbers of the population is an expensive undertaking. Further, the decision to take additional action such as referral for treatment or for more intensive assessment entails additional incurred costs associated with false

positive results. A second question that needs to be answered is whether those at or above the criterion represent cases that are clinically significant (Gambino, 2005). Clinical significance might be demonstrated by showing that those who meet or exceed criteria are more likely to seek help than those who do not (Productivity Commission (1999); Tremayne et al., 2001; WHO, 2004).

Conclusions

Researchers need to identify those risk and protective factors that are associated with the onset or prediction of pathological gambling if the terminology of risk is to be meaningful, useful, and relevant. This process is only recently underway and remains predominantly in the conceptual stage of development (Derevensky et al., 2004; Dickson, Derevensky, & Gupta, 2002; Evans, 2003; Messerlian et al., 2005; Potenza & Griffiths, 2004).

The best estimate of predicting the occurrence of pathological gambling, or the progression of the gambler to a more serious level, is to base it on the experiences of a large sample of people who are not pathological gamblers at the outset. These individuals are then followed over a defined period of time, e.g., 1 month, 6 months, 1 year, 5 years, 10 years, etc. The general task is to learn what proportion become pathological gamblers during the interval and determine the events and attributes that are associated with the change in status (Rothman & Greenland, 1998). The group is referred to as a cohort and the measure of interest is the incidence or inception of some event of interest, such as the onset of pathological gambling or movement to a more severe level.

What are needed, but currently lacking, are case definitions that can be related to the utility of clinical decisions (treat or not treat), their usefulness in testing research hypotheses (who is at risk), and their value for applications to policy (who will seek treatment), and that will, in the final analysis, serve to improve the health of those who suffer from gambling-related disorders. The latter is itself an unresolved question. Is there a single disorder that may be designated pathological gambling, or does the phenomenon encompass several distinct gambling disorders, for example, in the sense that different gaming venues (e.g., slot machines, scratch tickets, poker) have different etiologies or natural histories or that different treatment strategies will be required for these different forms of gambling (Toneatto, 2005)?

References

American Psychiatric Association. (1994).
Diagnostic and statistical manual of mental disorders (4th ed.). American Psychiatric Association, Washington, DC: Author.

British Columbia. (2003).
British Columbia prevalence study. Final report. Victoria: Ministry of Public Safety and Solicitor General.

Clarke, D.M., & McKenzie, D.P. (1994).
A caution on the use of cut-points applied to screening instruments or diagnostic criteria. *Journal of Psychiatric Research, 28*, 185–188.

Cox, B.J., Kwong, J., Michaud, V., & Enns, M.W. (2000).
Problem and probable pathological gambling: Considerations from a community survey. *Canadian Journal of Psychiatry, 45*, 548–553.

Derevensky, J.L., Gupta, R., & Dickson, L. (2004).
Prevention and treatment of adolescent problem and pathological gambling. In J.E. Grant & M.N. Potenza (Eds.), *Pathological gambling: A clinical guide to treatment* (pp. 159–168). Washington, DC: American Psychiatric Publishing.

Dickson, L.M., Derevensky, J.L., & Gupta, R. (2002).
The prevention of gambling problems in youth: A conceptual framework. *Journal of Gambling Studies, 18*, 97–159.

Evans, R.I. (2003).
Some theoretical models and constructs generic to substance abuse prevention programs for adolescents: Possible relevance and limitations for problem gambling. *Journal of Gambling Studies, 19*, 287–302.

Ferris, J., Wynne, H., & Single, E. (1999).
Measuring problem gambling in Canada. Final report. Phase I. Ottawa: Canadian Centre on Substance Abuse.

Finlayson, T.L., Moyer, C.A., & Sonnad, S.S. (2004).
Assessing symptoms, disease severity, and quality of life in the clinical context: A theoretical framework. *The American Journal of Managed Care, 10*, 336–344.

Gambino, B. (2004).
To test or not to test that is the question. *Weekly Addiction Gambling Education Report, 9*, 1–16.

Gambino, B. (2005).
Interpreting prevalence estimates of pathological gambling:

Implications for policy. *Journal of Gambling Issues, 14*. Available: http://www.camh.net/egambling/issue14/jgi_14_gambino.html

Gambino, B., Fitzgerald, R., Shaffer, H., Renner, J., & Courtnage, P. (1993).
Perceived family history of problem gambling and scores on SOGS. *Journal of Gambling Studies, 9*, 169–184.

Garmezy, N. (1994).
Reflections and commentary on risk, resilience, and development. In R.J. Haggerty, L.R. Sherrod, N. Garmezy, & M. Rutter (Eds.), *Stress, risk, and resilience in children and adolescents* (pp. 1–18). Cambridge: Cambridge University Press.

Jaeschke, R. Guyatt, G.H., & Sackett, D.L. (1994).
Evidence-based medical working group. User's guide to the medical literature. III. How to use an article about a diagnostic test. B. What are the results and will they help me in caring for patients? *Journal of the American Medical Association, 271*, 703–707.

Jenkins, R. (2003).
Making psychiatric epidemiology useful: The contribution of epidemiology to government policy. *International Review of Psychiatry, 15*, 188–200.

Kendell, R.E. (1989).
Clinical validity. In L.N. Robins & J.E. Barrett (Eds.), *The validity of psychiatric diagnosis* (pp. 305–323). New York: Raven Press, Ltd.

Kessler, R. (2002).
Epidemiological perspectives for the development of future diagnostic systems. *Psychopathology, 35*, 158-161.

Koch, M., Capurso, L., & Llewelyn, H. (1995).
Analyzing the discriminating power of individual symptoms, signs and test results. In H. Llewelyn & A. Hopkins (Eds.), *Analyzing how we reach clinical decisions* (pp. 51–67). London: Royal College of Physicians of London.

Kraemer, H.C., Stice, A., Kazdin, A., Offord, D., & Kupfer, D. (2001).
How do risk factors work together? Mediators, moderators, and independent overlapping and proxy risk factors. *American Journal of Psychiatry, 158*, 848–856.

Lesieur, H.R. (1984).
The chase: Career of the compulsive gambler. Cambridge,

MA: Schenken.

Messerlian, C., Derevensky, J., & Gupta, R. (2005).
Youth gambling problems: A public health perspective. *Health Promotion International, 20*, 69–79.

Miettinen, O. (1985).
Theoretical epidemiology. Boston: Wiley.

National Opinion Research Center (NORC) at the University of Chicago (1999).
Report to the National Gambling Impact Study Commission, February. Chicago: Author.

National Research Council (1999).
Pathological gambling: A critical review. Washington, DC: National Academy Press.

O'Conner, J., & Dickerson, M. (2003).
Definition and measurement of chasing in off-course betting and gaming machine play. *Journal of Gambling Studies, 19*, 359–386.

Potenza, M.N., & Griffiths, M.D. (2004).
Prevention efforts and the role of the clinician. In J.E. Grant & M.N. Potenza (Eds.), *Pathological gambling: A clinical guide to treatment* (pp. 145–157). Washington, DC: American Psychiatric Publishing.

Productivity Commission. (1999).
Australia's gambling industries. Report No. 10. Canberra, Australia: AusInfo.

Robins, L.N. (1985).
Epidemiology: Reflections on testing the validity of psychiatric interviews. *Archives of General Psychiatry, 42*, 918–924.

Rothman, K., & Greenland, S. (1998).
Modern epidemiology. Philadelphia: Lippincott-Raven.

Schlesselman, J.J. (1982).
Case-control studies. New York: Oxford University Press.

Schonert-Reichl, K.A. (2000, April).
Children and youth at risk: Some conceptual considerations. Paper presented at the Pan-Canadian Education Research Agenda Symposium, "Children and Youth At Risk," Ottawa, Canada.

Shaffer, H.J., & Hall, M.N. (1996).
Estimating the prevalence of adolescent gambling disorders: A quantitative synthesis and guide toward standard gambling

nomenclature. *Journal of Gambling Studies, 12*, 193–214.

Shaffer, H.J., & Hall, M.N. (2002).
The natural history of gambling and drinking problems among casino employees. *The Journal of Social Psychology, 142*, 405–424.

Shaffer, H.J., & Kidman, R. (2004).
Gambling and the public health. In J.E. Grant & M.N. Potenza (Eds.), *Pathological gambling: A clinical guide to treatment* (pp. 3–23). Washington, DC: American Psychiatric Publishing.

Shaffer, H.J., Hall, M.N., & Vanderbilt, J. (1997, December).
Estimating the prevalence of disordered gambling behavior in the United States and Canada: A meta-analysis. Boston: Harvard Medical School Division on Addictions, Harvard College Fellows.

Shaffer, H.J., LaBrie, R.A., LaPlante, D.A., Nelson, S.E., & Stanton, M.V. (2004).
The road less traveled: Moving from distribution to determinants in the study of gambling epidemiology. *Canadian Journal of Psychiatry, 49*, 504–516.

Susser, M. (1991).
What is a cause and how do we know one? A grammar for pragmatic epidemiology. *American Journal of Epidemiology, 133*, 635–648.

Toce-Gerstein, M., Gerstein, D.R., & Volberg, R.A. (2003).
A hierarchy of gambling disorders in the community. *Addiction, 98*, 1661–1772.

Toneatto, T. (2005).
A perspective on problem gambling treatment: Issues and challenges. *Journal of Gambling Studies, 21*, 75–80.

Tremayne, K., Masterman-Smith, H., & McMillen, J. (2001).
Survey of the nature and extent of gambling and problem gambling in the ACT. Sydney, Australia: Australian Institute for Gambling Research, University of Western Sydney.

World Health Organization (WHO). (2004).
Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization world mental health surveys. *Journal of the American Medical Association, 241*, 2581–2590.

Winters, K.C., Stinchfield, R.D., Botzet, A., & Anderson, N. (2002).
A prospective study of youth gambling behaviors. *Psychology*

of Addictive Behaviors, 16, 3–9.

Zhou, X.H., Obuchowski, N.A., & McClish, D.K. (2002). *Statistical methods in diagnostic medicine*. New York: John Wiley & Sons, Inc.

Manuscript history: submitted: April 8, 2005. This article was not peer-reviewed.

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Competing interests: None declared.

Ethics approval: None required.

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[1] Items enclosed by [ ] are the author's insertion, not Epictetus.

[2] Butler, R.L. (1974). Wood for Wood-Carvers and Craftsmen. New York: AS Barnes and Co.

issue 16 — april 2006

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