



EPIDEMIOLOGY RESOURCES

13627 Hatteras Street, Van Nuys, CA 91401 . 818-989-3029 . Fax-818-989-1829
www.epidemiologyresources.com/pamela.mahoney@epiresources.com

02/25/2010

Science of Dangerousness Prediction

Definition of Terms

Forensic- Relating to or dealing with the application of scientific knowledge to legal problems (Merriam-Webster dictionary)

meta-analysis-A statistical procedure to combine data across studies resulting in a more robust outcome measure.

Recidivism – The tendency to relapse into a previous state. In this case, it is the tendency of a formerly violent patient to have a violent episode after release from the hospital.

ROC – This stands for receiver operating characteristics, sometimes known as relative operating characteristics curve. The ROC curve is a statistic that can describe the accuracy of a test if used properly. ROC curve values range from .5 to 1.0. In order to fully understand the statistic, a short course in the predictive value of a test is necessary. An example of how the test is best used is given by the Massachusetts Water Resources Authority (www.mwra.state.ma.us/harbor/enquad/pdf/2005-20.pdf.) You can see by this graph that the curve is used to determine a cutoff point where the true positives are maximized and the false positives are minimized.

The way to interpret this ROC score when predicting recidivism is: If you have two guys, one who committed the offense and one who did not, there is a 72% chance that the guy who committed the offense would get a higher score on the test compared to the guy who did not commit the offense. This is not dependent on the level of the test score for either person.

Shrinkage- Shrinkage is the reduction of the predictive power of a test when it is used outside the research environment. Real world usage of a test introduces uncertainties that diminish the reliability, validity and predictive power of a testing instrument.

Violence base rate – The naturally occurring rate of violence in the population to which the index patient belongs. The base rate is also known as the background level or population prevalence. The “base” population can be designated by neighborhood, city, ethnicity or any number of group identifiers. This term is important because some statistics are dependent on this figure like specificity, sensitivity, positive predictive value and negative predictive value.

Understanding Test Results

How well a test works is a function of its sensitivity, specificity, predictive value and efficiency. The formulas are summarized below.

	Test Positive	Test Negative
Disease Present	True Positive (TP)	False Negative (FN)
Disease Absent	False Positive (FP)	True Negative (TN)

SENSITIVITY - Sensitivity of a test is the percentage of all patients with disease present who have a positive test.

$$\frac{TP}{TP + FN} \times 100 = \text{Sensitivity (\%)}$$

SPECIFICITY - Specificity of a test is the percentage of all patients without disease who have a negative test.

$$\frac{TN}{FP + TN} \times 100 = \text{Specificity (\%)}$$

PREDICTIVE VALUE - The predictive value of a test is a measure (%) of the times that the value (positive or negative) is the true value, i.e. the percent of all positive tests that are true positives is the Positive Predictive Value.

$$\frac{TP}{TP + FP} \times 100 = \text{Predictive Value of a Positive Result (\%) (same as sensitivity)}$$

$$\frac{TN}{FN + TN} \times 100 = \text{Predictive Value Negative Result (\%) (same as specificity)}$$

TEST EFFICIENCY - The efficiency of a test is the percentage of the times that the test gives the correct answer compared to the total number of tests.

$$\frac{TP + TN}{TP + TN + FP + FN} \times 100 = \text{Efficiency of a Test Result (\%)}$$

Reliability of a test – A measure of the test's consistency? It is the repeatability of the test. Will the test results be the same if the same person takes the test more than once if all else has remained the same?

Validity of a test - Validity is the strength of the conclusion. Is the test right? One measure of validity is the test efficiency.

Testing instruments

Psychopathy Checklist revised (PCL-R)

ROC: .75 within 5 years (Grann M 1999)

Outcome measure

Definition of violent crime ranged from conviction of homicide to trespassing. Follow-up times ranged from .7 to 106 months.

The PCL-R is a 20-item symptom rating scale that allows qualified examiners to compare a subject's degree of psychopathy with that of a prototypical psychopath. The items measure attributes such as glib and superficial charm, grandiosity, need for stimulation, pathological lying, cunning and manipulating, lack of remorse, callousness, poor behavioral controls, impulsivity, irresponsibility, failure to accept responsibility for one's own actions.

Population

The manual, published in 1991, stated that this meant only adult male forensic populations (e.g., institutional or community correctional facilities, forensic psychiatric hospitals, and pre trial evaluation or detention facilities.) However, on his website, Hare now states that the evidence supports its use with female and adolescent offenders, as well as with sex offenders and refers to his 1998 publication to clarify the use of this tool (Hare 1998) . The original Grann study looked at Swedish offenders with schizophrenia.

References

<http://www.hare.org/scales/pclr.html>

VRAG – Violence Risk Appraisal Guide
ROC: .76 (Rice and Harris 1995)

Table 3
*Contingency Table Calculated for the Smoothed Receiver
Operating Characteristic Curve for Area = .76 at the Point
Corresponding to a Hit Rate (Sensitivity) of .60, a False-Alarm
Rate of .23 (Specificity = .77), and a Base Rate of .10*

Predicted outcome	Actual outcome		Total
	Violent	Nonviolent	
Violent	6	21	27
Nonviolent	4	69	73
Total	10	90	100

This test uses developmental, personality, non-violent and violent history items. The tool uses the clinical record, particularly the psycho-social history component, as a basis for scoring as opposed to interview or questionnaires. It contains a 12-item actuarial scale that includes the PCL-R score. The instrument predicts for 7 and 10 years the risk of violent (non-sexual) acts.

Population

This test should be used for adult males only and is specifically used to assess violence prediction in mentally disordered offenders. Tested in Canada, it seemed to work equally well over time periods varying from 3.5 years to 10 years(Rice and Harris 1995).

References

Quinsey, G., Harris G., Rice, M., & Cormier, C. (1996). *Violent Offenders: Appraising and Managing Risk*. Washington, D.C.: American Psychological Association.

Historical Clinical and Risk Management Scheme (HCR-20)

ROC: .76 (Douglas KS 1999)

The HCR-20 is a structural clinical guide consisting of 20 items that help the clinician research and evaluate the patient's probability of recurring violence. It includes the PCL-screening version. Predictions based on the HCR-20 are estimates of the likelihood of violence, and should be presented in terms of low, moderate, or high probability of violence. Probability levels should be in the context of either short- or long-term time frames. The instrument should be used in conjunction with other measures and clinical judgment. It is a dynamic tool and is not meant to be administered just once; the nature of risk assessment requires ongoing reassessment as circumstances change.

Items in the HCR-20 Risk Assessment Scheme

Sub-Scales

Items

Historical Scale

H1	Previous Violence
H2	Young Age at First Violent Incident
H3	Relationship Instability
H4	Employment Problems
H5	Substance Use Problems
H6	Major Mental Illness
H7	Psychopathy
H8	Early Maladjustment
H9	Personality Disorder
H10	Prior Supervision Failure

Clinical Scale

C1	Lack of Insight
C2	Negative Attitudes
C3	Active Symptoms of Major Mental Illness
C4	Impulsivity
C5	Unresponsive to Treatment

Risk Management Scale

R1	Plans Lack Feasibility
R2	Exposure to Destabilizers
R3	Lack of Personal Support
R4	Noncompliance with Remediation Attempts
R5	Stress

Note. Adapted from Webster, Douglas, Eaves, and Hart (1997a).

<http://www.violence-risk.com/hcr20annotated.pdf>

Population

The HCR-20 is used to aid in the determination of best treatment and management strategies for potentially violent, mentally disordered individuals, including parolees, forensic mental health patients, and others. Suitable for both men and women.

Outcome measures

The Douglas study included all acts of "violence" ranging in severity from homicide to pushing.

<http://www.minddisorders.com>

Selected References

Douglas KS, O. J., Nicholls TL, et al (1999). "Assessing risk for violence among psychiatric patients: the HCR-20 violence risk assessment scheme and the Psychopathy Checklist: screening version." Journal of Consulting and Clinical Psychology **67**: 917-930.

Grann M, L. N., Tengström A, et al (1999). "Psychopathy (PCL-R) predicts violent recidivism among criminal offenders with personality disorders in Sweden." Law and Human Behavior **23**: 205-217.

Hare (1998). "The Hare PCL-R: Some issues concerning its use and misuse." Legal and Criminological Psychology **3**: 101-122.

Rice, M. E. and G. T. Harris (1995). "Violent recidivism: Assessing predictive validity." Journal of Consulting and Clinical Psychology **65**(3): 737-748.

Vergare, Binder, et al. (2006). "Practice Guideline for the Psychiatric Evaluation of Adults " APA Practice Guidelines: 1-62.

Expert Qualifications

The basic guidelines for employing any testing instrument dictate that clinicians:

1. Possess an advanced degree in an appropriate field such as the social, medical, or behavioral sciences (Ph.D., D.Ed. or M.D. or equivalent ;)
2. Be registered with at least one body that regulates the assessment and diagnosis of mental disorder (e.g., psychological or psychiatric association);
3. Not evaluate their own patients(Vergare, Binder et al. 2006); This creates a conflict for the clinician. Is s/he responsible to the client or the entity requesting the evaluation.
4. Have ample experience with forensic populations;
5. Limit the use of the testing instruments to those populations in which it has been validated.
6. Insure that they have adequate experience and training in the use of the specific testing instrument employed.
7. Realize that there is no method for a definite prediction of violence. Any method employed will result in an estimate of probability that comes with some error.