

## Risk Factors for Suicide: Summary of a Workshop



Prepared by Sara K. Goldsmith, Board on Neuroscience and Behavioral Health, Institute of Medicine

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# Risk Factors For Suicide

summary of a workshop

prepared by

Sara K. Goldsmith

Board on Neuroscience and Behavioral Health

INSTITUTE OF MEDICINE

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*Knowing is not enough; we must apply.*

*Willing is not enough; we must do.*

—Goethe



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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

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Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by John Kalafat, Graduate School of Professional Psychology, Rutgers University. Appointed by the National Research Council and Institute of Medicine, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authors and the institution.

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## Risk Factors for Suicide

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## INTRODUCTION

Two workshops were convened for the committee on the Pathophysiology and Prevention of Adult and Adolescent Suicide of the Institute of Medicine. Workshop I was on Risk Factors for Suicide and convened on March 14, 2001. Workshop II was on Suicide Prevention and Intervention and convened on May 14, 2001. The two workshops were designed to allow invited presenters to share with the committee and other workshop participants their particular expertise in suicide, and to discuss and examine the existing knowledge base.

The two workshops are part of the information-gathering activities that inform the work of the committee. It is the committee's task to assess the science base of suicide etiology, evaluate the current status of suicide prevention, and examine current strategies for the study of suicide. Its full report will include consensus statements on the scientific literature of the causes of and risk factors for suicide, and will illuminate contentious issues and gaps in the knowledge base that should guide prevention efforts and intervention. This is the summary for Workshop I, Risk Factors for Suicide.

Participants for Workshop I Risk Factors for Suicide were selected to represent the following areas: epidemiology and measurement, socio-cultural factors, biologic factors, developmental factors and trauma, and psychologic factors. For the different topic areas, the committee hoped to summarize current knowledge on the role of the risk factors in suicide and attempted suicide. Participants were asked to present current and relevant knowledge in each of their expertise areas—knowledge both empirically-derived as well as commonly known from professional experience. The agenda for the workshop is in [Appendix A](#).

This workshop was not intended to be a formal or comprehensive review or an analysis of the scientific literature on risk factors for suicide or attempts. No conclusions or recommendations were made from this activity.

This report will summarize major themes that emerged over the course of the one-day workshop. Quotations are provided from the workshop discussions.

Although the workshop participants present from a number of diverse perspectives, all share a fundamental belief in the potential for better suicide prevention.

### EPIDEMIOLOGY OF SUICIDE

Dr. Eve Mościcki reviewed the risk factors for completed and attempted suicide, highlighting those with the most promise for prevention. Her presentation focussed on population-based studies, rather than clinical studies. The vital statistics collected by the Centers for Disease Control, via the ICD-9 classification system, were her primary source. The other data Dr. Mościcki discussed are drawn from population-based psychological autopsy studies.

Dr. Mościcki stated that our current reporting system for suicide is not uniform. It is split approximately evenly between two systems: the medical system where the person signing the death certificate is a medical examiner with a medical degree, and the legal system where the person signing the death certificate is a public official, often elected and with a judicial degree. In seventeen states the system is mixed, with different counties using medical or legal systems. Criteria for classification of suicide deaths were developed in the late 1980s via a task force convened by the American Association of Suicidology. The need to address both lethality and intent as part of an operational definition of attempted suicide was identified as one of the major classification issues. The agreed-upon classification system is still not uniformly applied, which leads to in-

consistencies across jurisdictions. Yet Dr. Mościcki expressed the belief that, in general, the classification system works, and “by and large we can be fairly confident that when a death is classified as a suicide, that it is a genuine classification.”

In 1998 suicide was the eighth leading cause of death. The age-adjusted rate was 10.4 per hundred thousand (as compared to the leading cause of death, diseases of the heart at a rate of 127 per hundred thousand). The suicide rate has declined very slowly since the time of the adoption of the ICD-9 coding system in 1979. There are differences in rates across states, and across sub-groups within the U.S. population. Western and frontier states have the highest suicide rates, with the lowest rates in the mid-Atlantic states. For example, Alaska had the highest, and New Jersey the lowest rate in 1998. There are striking differences in rates across racial and ethnic groups, and across gender. Men, older people and Americans of European decent have higher rates of suicide. Widowed persons have higher rates of suicide than married people. There are similarities between rates across the lifespan for African American men, Native Americans, and Alaska Natives: the rates are higher in the younger age range. In contrast, the peak for Caucasian men is during old age. Women do not show large rate changes over the life-span; there is no peak for women of any race or ethnicity.

***The suicide rates in the U.S. are largely driven by rates for white men.***

*Eve Mościcki*

Dr. Mościcki reported that the mechanism of choice in the United States is firearms. Among men, firearms account for about 62 percent of all suicide deaths; among women, about 39 percent. Hanging and self-poisoning are the distant second and third mechanisms of death.

Dr. Mościcki noted that there are few national data on rates of suicide attempts. Estimates for life-time prevalence range from 1 percent to over 7 percent. The 12-month prevalence estimates range from about 0.2 to 2.6 percent. Women report greater rates of attempted suicide than men across the lifetime, but no significant difference is found when asking about recent attempts. Younger people, those with lower educational achievement, and previously married persons (as compared with married) all have higher rates of suicide attempts. The data from one of the studies, The National Co-Morbidity Study, investigated the degree of intent of the non-fatal attempts, and found that approximately half of the attempters indicated they did not really intend to die.

The current data indicate that suicide is the result of interactions among risk and protective factors. Risk factors can be broken down into distal (underlying vulnerability) and proximal (precipitants), which is an important distinction in terms of prevention strategies because the strategy will be different depending on the category of risk being targeted.

***The primary risk factor for suicide is psychopathology.***

*Eve Mościcki*

The co-occurrence of distal and proximal risk factors leads to the necessary and sufficient conditions for attempted or completed suicide. Strong epidemiologic evidence suggests that psychopathology is the most critical distal risk factor for suicide. Over 90 percent of completed adult and 67 percent of completed youth suicides meet diagnostic criteria of a psychiatric diagnosis. Psychopathology has also been found in the large majority of serious suicide attempts in the few published case-controlled studies. The most common diagnoses are mood disorders, substance abuse disorders, personality disorders, and schizophrenia. Dr. Mościcki stated that although there

is a consistent high association between psychiatric and addictive disorders with suicide, it remains undetermined whether suicide is the result of the severe expression of these disorders, or a separate, overlapping entity. One of the reasons it remains unclear whether suicide is distinct from psychiatric disorders is that the vast majority of studies use post-mortem diagnoses (psychological autopsies), and do not ascertain whether the diagnosis could still be made if the suicide had not occurred. This leads to the possibility of over-diagnosis of depression.

Co-morbidity, the presence of more than one psychiatric or substance abuse disorder, is also an important risk factor. Of the psychological autopsies examining co-morbidity, 70–80 percent of completed suicides were found to have co-morbid conditions, with the most common being mood disorders and alcohol abuse. In the elderly, mood disorders are often co-morbid with a physical disorder, but physical illness does not appear to independently increase risk. Similarly, panic disorder in conjunction with depression may be a signal for suicide risk, but it does not appear to be an independent risk factor as had been previously thought.

Other distal risk factors for suicide are neurochemical abnormalities, the most prominent of which is serotonin system dysfunction. This is independent of psychiatric diagnosis and associated with subjective severity of symptoms and a history of planned and medically lethal suicide attempts. Reduced levels of cholesterol have also been associated with risk for suicide. Dr. Mościcki reported that family history of psychopathology and suicidal behavior is a risk factor that might function by altering biological vulnerability and serotonin functioning. Additionally, family history represents a genetic contribution to underlying biological factors. A dysfunctional family environment with multiple stressors has been shown to contribute to suicidality.

***...the nature of the stressor may be less important than the actual number of stressors. The greater the number of stressors in a person's life, the higher the suicide risk.***

*Eve Mościcki*

Dr. Mościcki went on to review the proximal risk factors for suicide. She stated that "...the presence of firearms in the home is a primary proximal risk factor for completed suicides." Additionally, availability of prescription medications can be a risk factor in elderly populations.

Stressful life events can also precipitate suicidal behavior, though an individual's perception of stress is highly subjective and determines the extent to which the stress increases suicide risk. Thus, the type of stressor varies across the lifespan as individuals' perceptions change. An intense stressor in a young person might be a relationship loss or a humiliating experience, while in an older person it is more likely to be the death of a spouse, suspicion of a terminal illness, perceived loss of independence, or sudden disability. Dr. Mościcki reported that the nature of the stressor appears to be less important than the number of stressors; a greater number of stressors results in higher suicide risk.

Intoxication, outside of a substance abuse diagnosis, is an immediate risk factor for suicide. Fifty percent or more of all completed suicides are intoxicated at the time of death. Contagion is another potential precipitant to suicide, particularly in young people. However, the effect of contagion in murder-suicides is less clear, since many of the reports are anecdotal and thus make generalizing difficult. Incarceration can be a precipitant to suicide as well; so much so that suicide is the leading cause of death in jails. Because individuals who end up in jails often have a higher number of distal risk factors as well, this is a complex causal relationship. Many incarcer

ated persons have some form of psychopathology, and Dr. Mościcki stated "...increasingly in this country the justice system has become a de facto service system for mentally ill persons."

A debate exists about the proposed risk factor of sexual orientation. Dr. Mościcki reported that the evidence for sexual orientation as an independent risk factor for suicide is lacking. Suggestive evidence exists for rising rates of attempts in gay and lesbian youth; however, no research has been done that controls for underlying psychopathology. Two psychological autopsy studies have been done and have not found an increased risk with any sexual orientation. Dr. Mościcki stressed the need for more work in this area.

Dr. Mościcki concluded her talk with several recommendations for the future of the epidemiology of suicide. They were: (1) Increase the integrative research on the interaction between individual and environmental factors. (2) Increase research on the protective factors against suicidality. (3) Expand knowledge on suicide morbidity and mortality in minority populations. The protective factors found in these populations may translate into preventive interventions. (4) Increase understanding of the cultural context of suicide risk and prevention. (5) Standardize the nomenclature for suicidal behaviors. (6) Clarify the relationships of medical illness, panic attacks, prescription medications, and sexual orientation with suicide risk. (7) Develop improved models to predict imminent suicides. (8) Identify the implications for preventive interventions in the current knowledge base. Dr. Mościcki stated that her talk suggested two systematic environmental interventions: reduced psychiatric and substance abuse morbidity through better identification and appropriate treatments; and limited access to firearms. (9) Increase work on the development, testing, and dissemination of empirically-based preventive interventions, with rigorous testing for safety, efficacy, and transportability. (10) Consider the public health and policy relevant outcomes of interventions.

#### ISSUES IN MEASUREMENT OF SUICIDE RISK FACTORS IN ADULTS

Dr. Gregory Brown discussed overall needs in the field of measurement and assessment of suicidal risk. In the 1999 Surgeon General's "A Call to Action to Prevent Suicide," one of the points made was the need to advance the science of suicide prevention. Dr. Brown stressed the importance of suicide prevention programs, including evaluation. This requires developing reliable and valid measures of suicide ideation and suicidal behavior.

The effectiveness of prevention programs to prevent suicide is unknown. Suicidal people are routinely and purposefully excluded from the vast majority of randomized clinical trials for psychiatric disorders. Further confounding the issue, most studies do not use screening measures for suicidal ideation, but frequently use a single item from the Hamilton Depression Scale. Only a small number of these studies report a change in suicidality, but without proper measurement the meaning is unclear.

***Suicide ideation is an independent predictor of suicide risk above and beyond affective illness.***

*Gregory Brown*

The field of measurement would benefit from two changes: the use of screening measures with appropriate psychometric properties in clinical studies, and the adoption of common, operationalized nomenclature.

Dr. Brown briefly reviewed the existing measures. These include quick screening measures that have been used in community surveys, clinical trials, and primary care settings. One of the

most widely used and best evaluated measures is the Scale for Suicide Ideation (SSI). It is a 19-item scale, available as interview, self-report, and computer-administered. If a person endorses an item indicating intent to commit suicide, then the rest of the scale is administered. It has been standardized on both inpatient and outpatient psychiatric samples. It has also been used in emergency rooms, primary care settings, jails, and in college student samples.

Dr. Brown described a study he did with Dr. Aaron Beck involving almost 7,000 patients. This was a prospective study with up to 20-year follow-up with psychiatric outpatients. Patients received standardized, structured interviews and standardized assessment measures. These data were matched to the National Death Index, and death certificates were obtained for those who had died. Through this process, 49 suicide cases were identified. The average length of follow-up was ten years, and the average length of time to death was approximately 4.3 years from the baseline interview. Patients who scored above 3 on the SSI were about 6.5 times more likely to commit suicide than patients who scored below this cut-off. The scores on several other scales were also elevated: the Beck Hopelessness Scale (about 4.4 risk ratio), Beck Depression Inventory, Beck Anxiety Scale, and the Hamilton Rating Scale for Depression. Psychiatric hospitalization, suicide attempts, bipolar disorder, major depression, and suicide ideation were significant risk factors. Analyses further revealed that “recurrent depression is much more predictive of completed suicide than single episodic depression, underscoring] the chronicity of the disorder may very well be a key risk factor for suicide.”

Trying to predict suicide, a binary event occurring at a low base-rate, is very difficult, as further discussed by Drs. Robert Gibbons and Ming Tsuang. The best approach has been to use the Poisson distribution which is the limiting form of the binomial. This method allows statistical prediction of an event, but it does not allow exact prediction. Another problem is the underestimation of suicide by using only death certificates as Dr. Tsuang pointed out. He noted that family members sometimes present suicide notes, even though the death certificate states cause of death as “unknown” or “accidental.”

Dr. Brown summarized by making several recommendations. (1) There should be more consistent use of measures across studies to make comparisons possible. It is important to be able to examine findings across studies since suicide is a low base rate event. (2) Multivariate models are preferable for predicting risk; they have greater predictive value, as compared to single measures. (3) Measures need to be developed for the elderly, minorities, males, and females, since there is some evidence that suicide ideation and behavior varies across groups. (4) Refine and research a universally adopted nomenclature. (5) Use complete, standardized suicide assessment measures in clinical trials, not single items, and not the sole use of non-suicidal measures. (6) Develop greater interest among clinical researchers for working with suicidal patients. (7) Include evaluation components in all suicide programs.

### ISSUES IN MEASUREMENT OF SUICIDE RISK FACTORS IN YOUTH

Dr. David Goldston reviewed assessment instruments for suicidal behaviors and risks in youth, including recommendations for further needed work.

He described four broad categories of instruments: (1) detection instruments; (2) risk assessment instruments; (3) assessment of clinical characteristics of suicidal behavior and; (4) a miscellaneous category (e.g., compilations, assessment of attitudes around suicide, projective measures). He evaluated the first three categories of instruments as to the degree to which queries regarding suicidal behaviors were consistent with operational definitions, the samples used for

instrument development, use in treatment studies, and the psychometric characteristics, including reliability, concurrent validity, and predictive validity.

Dr. Goldston found that in the past decade, there has been a tremendous growth in the assessment of youths thought to be at risk of suicide. Dr. Goldston concluded that there are several promising instruments but a lack of data demonstrating usefulness. Dr. Goldston described seven major concerns about the field of assessment of risk of youth suicide.

***...more effort has been devoted to developing new instruments for identifying atrisk youths than has been focused on thoroughly, systematically, and carefully evaluating the properties and utility of instruments already at hand.***

*David Goldston*

- (1) Lack of Universal Nomenclature. Dr. Goldston described how despite twenty-five years of periodically revisiting the nomenclature issue, with each effort calling for adoption of consistent, common nomenclature, it has yet to happen. This continues to impede comparisons across studies, which are essential to the study and treatment of a low base-rate behavior.
- (2) Paucity of Prospective Studies. The second major problem Dr. Goldston identified was a paucity of prospective studies. In fact the primary validation strategy used in most studies involved comparing responses across groups differing in suicidal histories. Most instruments for examining risk are predicting what has already happened. This approach is expedient, but it cannot substitute for prospective studies of risk. Of the 15 instruments designed to identify youths at risk, only 3 demonstrated predictive validity. The Reason for Living Scale and Beck Hopelessness Inventory had predictive validity in clinical populations, although not all studies with the Beck Hopelessness scale had significant effects. The Suicide Probability Scale was found to have a very small, but statistically significant predictive validity.

***...There is no shortcut The only way to discover who is at risk in the future is to follow individuals thought to be at risk... for some significant period of time.***

*David Goldston*

- (3) Need to Match Assessment Measure to Population. Dr. Goldston noted that instruments may not have the same predictive utility when used in populations other than those in which they were developed. The base rate of risk factors may vary significantly across different populations, so that the same level of a risk factor may have significant predictive utility in some groups, but not others. In addition to base rate differences, risk factors may vary in meaning, salience, and/or presence across groups. In fact, emerging findings suggest that first-time suicide attempters may differ from those who attempt more than once, and that predicting first and later attempts may involve different risk factors. This distinction was borne out in a study of Dr. Goldston's in which he and colleagues "found hopelessness to be a strong predictor of future suicide attempts following hospitalization among adolescents who previously made at least a single suicide attempt." In contrast, they did not find hopelessness to be a significant predictor in those without a history of suicide attempt(s).
- (4) Insufficient Attention Paid to Any Type of Validity other than Predictive Validity. Dr. Goldston believes that there has been insufficient attention paid to discriminant validity, that is, the degree to which suicidal risk instruments do not correlate with constructs with which they

should not. Incremental validity, the degree to which a test provides information not available elsewhere, has also been neglected.

- (5) **Widening Focus of Risk Assessment.** Dr. Goldston suggested that, in light of the low base rate and dire outcome of completed suicide, development of risk assessment measures should be broadened to include prediction of suicidal ideation and attempts. Suicide attempts and suicidal ideation have considerably higher base rates and are markers for a variety of psychiatric and coping problems. Consequently, they provide important information about youths who may be at risk for continuing suicidal and other high-risk behaviors. In addition, suicide attempts are a primary reason for referral to child psychiatric emergency services and psychiatric hospitalization.
- (6) **The Need to Study Predictive Validity of Intent.** While clinicians ranked “seriousness of last attempt” as highest in making clinical judgements of current risk, there have been no scientific data to validate “seriousness of last attempt” as having any predictive validity for suicide in children.
- (7) **Appropriateness of Assessment Instruments for Treatment Research.** Outcome measures should be sensitive to change; should not be subject to practice effects, or attenuation with repeated administrations; and should have demonstrated utility in intervention studies. These questions remain unanswered due to the lack of controlled intervention studies.

***Our elderly depressed with prior suicide attempts, even after their depression seems to remit, have ongoing persistently higher levels of hopelessness.***

*Charles Reynolds*

Hopelessness, and its overlap with depression, was discussed as both a useful predictor of future risk and as a possible point of intervention and treatment. Dr. Charles Reynolds pointed out that some of Dr. Goldston’s data underscore the importance of treating hopelessness as a core symptom, whether depression or other disorders are present. Dr. Reynolds described similar findings in his work with colleagues with the elderly. Dr. Jan Fawcett reported that he and colleagues found overlap on the hopelessness variable between suicide attempters and completers, whereas all the other risk factors studied for suicide did not overlap. Dr. John Mann discussed data from his laboratory indicating that depression, hopelessness and suicidal ideation were somewhat, related to each other. Dr. Mann and colleagues found similar correlations with suicidal behavior and any of these three indicators independently or with a factor incorporating all three traits. This is not surprising, Dr. Goldston explained, since measures of hopelessness and depression often overlap; for example, the Beck inventories for each have about a 50 percent overlap of items. Also, hopelessness is a core symptom of depression. Dr. Goldston described unpublished data suggesting that hopelessness has trait characteristics, and persists even after other depressive symptoms and other predictors of suicidal behavior remit. Other unpublished data show that hopelessness is associated with incarceration and treatment dropout, which may offer another method of focusing in on hopelessness despite its high correlation with the overall severity of depression. He pointed out the conundrum in our attempts to identify future suicides: existing risk measures and indices may help in identifying who is at risk, but do not tell us when they will be at risk. Conversely, the occurrence of certain life events is known to be an acute precipitant for some at risk for suicide, but not all.

## SOCIAL AND CULTURAL FACTORS IN SUICIDE RISK

Dr. Ronald Maris advocated the need for multi-disciplinary studies of suicide in order to develop an integrated causal model that includes biological, psychological, and social factors. In his talk, he briefly reviewed social and cultural factors, including age, sex, race, ethnicity, social isolation, contagion, and religion.

Dr. Maris quickly summarized group differences in suicide rates. There are large differences in suicide rates across race, sex, age, and ethnicity. These differences may be informative for identifying risk and protective factors. The relative risk of a white male versus a black female suicide, controlling for age, is almost 10 to 1. Comparing rates for the oldest sub-population of each group, this ratio rises to 18 to 1. Data from the Epidemiologic Catchment Area Study indicate that black women attempted suicide at about the same rate as white women, but had fewer completions. They were distinguished from white females by having more social supports, larger extended families, more religious proscription against suicide, stronger mothering ethos, and fewer visits to the doctor.

*African-American women, particularly in midlife, are virtually immune to suicide.*

*Ronald Maris*

In the United States, male suicide rates are about 4.5 times that of females. “These gender ratios do not persist internationally, suggesting the influence of social and cultural factors,” Dr. Maris stated. The relative risk for male-female suicides for the ages of 55 to 64 is 7.9 in Singapore and 1.8 in Beijing. Hungary has the highest national suicide rate in the world at 66 per hundred thousand. Finland and Austria are next highest, with rates of 43 and 42 respectively, as compared the U.S. rate of 10–12 per hundred thousand. Dr. Maris stated that “most of these high suicide rate countries have higher rates of depressive disorder, high levels of alcohol consumption, often apart from rituals or food intake, a greater relative proportion of an older population, more social isolation, more cognitive rigidity and inflexibility...”

Some nations report very low suicide rates; for example the rate in Mexico is 2.5 per 100,000, which is about 26 times lower than Hungary. Countries with low suicide rates tend to be predominantly Catholic or Muslim, are typically relatively youthful, have strong social control networks, more extended family ties, and explicit proscription of suicide. In some cases countries with lower suicide rates also have lower rates of depression. Dr. Maris mentioned that some cultures do not stigmatize suicides under particular circumstances such as loss in battle, acute and mortal infirmity, and sacrifice for the physical and/or economic survival of others.

*...Most social involvement is negatively correlated with the suicide rate.*

*Ronald Maris*

Dr. Maris discussed the effect of social isolation on suicide rates. He reported suicide outcome is enhanced by the loss of necessary social supports, increases in hostility and aggression, the corresponding reduction of targets for the aggression other than oneself as occurs in jail, greater impulsivity resulting from fewer social constraints, and isolation-enhanced depression, sleep disorder, and hopelessness. Dr. Maris found a significant negative correlation between population per household and suicide rate in a survey study in Chicago. Follow-up work in Chicago revealed that the natural death controls had twice as many close friends than the suicide

cases on average. Dr. Maris described an earlier study that also found suicide rates to be correlated with indices of limited social contact such as living alone and being divorced.

On the other hand, some social relationships increase suicide risk. Stress from relationship difficulties can precipitate suicide. Other special social circumstances influence suicide such as cult suicides, homicide-suicides, and kamikaze pilots in World War II.

Dr. Maris went on to discuss the issue of suicide contagion. Suicides in adults increase approximately 2 to 3 percent for 7 to 10 days following published suicide stories due to contagion, according to data cited by Dr. Maris. Suicides of entertainers and celebrities are copied, but those of artists, the economic elite, or villains are not. Other data have shown additional influences on contagion. Similarities in demographics between the stimulus suicide and those who may imitate increases the risk. Teenagers are approximately twice as likely to imitate a stimulus suicide than adults.

***The more the stimulus suicide is praised, glorified, or rewarded, the more likely the copying will occur.***

*Ronald Maris*

Dr. Maris noted that religion is a neglected topic in suicide risk. In the United States government documents such as the census and death certificates are required by law to omit religious information, making systematic study of the role of religion in suicide risk difficult. There is a general assumption that involvement in many world religions reduces suicide risk, especially for religions that teach eternal damnation for those who commit suicide. In Chicago and New York City Dr. Maris found that Protestants had approximately double the suicide rates of Catholics after controlling for race, sex, and age. Yet Hungary and Austria, predominantly Catholic countries (68 and 90 percent, respectively) have among the highest suicide rates in the world. One possible explanation for these disparate findings is that suicide is reduced by religious involvement and participation in rituals and ceremonies, not simply by affiliation. Dr. Maris's research on religion and suicide found that non-suicidal males were more than twice as likely to attend church on Christmas as those who committed suicide, regardless of denomination.

Dr. Mann emphasized Dr. Maris' comments on the complexity of religious beliefs on suicide. He gave the example that in Judaism, self-murder is only defined as suicide in the absence of significant psychosocial stressors or mental illness. Yet the majority of self-identified Jews do not know this technical distinction, and believe all suicides are prohibited by Jewish law.

Dr. Kleinman stated that the Confucian Asian countries such as China, Japan, and Vietnam, have higher suicide rates than non-Confucian Asian societies. Those with a significant Buddhist component often have lower rates, but these are very sensitive to macro-social circumstances. For example, the Sinhalese in Sri Lanka had one of the world's lowest suicide rates, but after 20 years of political violence they now have a very high suicide rate. Similarly, in Thailand and other southeast Asian nations, the suicide base-rate was low, but then increased with political destabilization and major economic change at the macro level.

Finally, Dr. Maris discussed suicide risk in incarcerated populations. Dr. Maris reported that in jail, and to a lesser degree in prison, suicide occurs most frequently among new arrivals (58 percent of prison suicides occurring with 48 hours of confinement; 29 percent in the first three hours). Most commonly, those who commit suicide are male (95 to 100 percent), meet the criteria for antisocial personality disorder, and have affective and/or anxiety disorders (67 percent).

Often they are isolated from other inmates. Cognitive impairment is low, and most are not psychotic. Prison suicides tend to have histories of early and continuing substance abuse, primarily alcohol. Standard fifteen minute intervals between checks are not sufficient since the most common methods of suicide by incarcerated persons is hanging or asphyxiation, which can occur in as little as 6 minutes.

***Suicide is the leading cause of death in the U.S. jails and prisons...***

*Ronald Maris*

Dr. Maris listed ways to reduce jail and prison suicides: (1) do not isolate inmates; (2) increase staff watch for the first three hours of confinement; (3) increase frequency of visual checks, possibly by video camera; (4) remove all dangerous items; (5) increase checks after significant life-changes (e.g., changes in housing status or sentencing, major relationship changes such as divorce or change in attorney or key staff, or parole denial); (6) increase watch during meals and weekends when suicide tends to increase; (7) diagnose and treat psychiatric conditions; (8) increase observation of young males, especially those who are belligerent and/or intoxicated; (9) educate staff in proper emergency responses and; (10) assess suicide risk. Dr. Maris underscored that proper assessment of suicidality is rare.

**NEUROBIOLOGY OF TEENAGE AND ADULT SUICIDE: POSSIBLE BIOLOGICAL MARKERS FOR IDENTIFICATION OF SUICIDAL PATIENTS**

Dr. Ghanshayam Pandey spoke about changes in the serotonin system in the post-mortem brains of adolescent suicides, and biochemical models which may be useful for identifying persons at risk for suicide.

Adolescents differ from adults in the cluster of psychiatric disorders associated with suicidal risk. Whereas affective disorders, bipolar disorder, and drug and alcohol abuse are major risk factors for adult suicide, conduct and adjustment disorders are more frequent in adolescents with suicidal behaviors.

Other risk factors common in adolescent suicides are stress, family conflict, legal and discipline problems, and chaotic, abusive, or neglectful environments. Another difference between adult and adolescent suicide, Dr. Pandey reported, is that adolescents tend to be more responsive to selective serotonin reuptake inhibitors (SSRIs) than to tri-cyclic antidepressants, whereas adults are responsive to both.

A growing body of studies indicates abnormalities in serotonin functioning associated with suicidal behaviors. Many, but not all, post-mortem brain studies find alterations in serotonin receptors, and studies of cerebrospinal fluid find altered serotonin metabolites. Alterations in neurotransmitter systems other than serotonin have also been found in the post-mortem brain, including changes in alpha-1 and alpha-2 adrenergic receptors.

It is also important to investigate the functional consequences of abnormal neurotransmitter systems. Different types of serotonin receptors are linked to the phosphoinositide and adenylate cyclase signaling systems. These and other biochemical pathways may be important both to the understanding as well as the prevention of suicide.

Few studies focus on the neurobiology of adolescent suicide. Dr. Pandey described his research on a well-characterized set of adolescent suicides and case-controls. The brain samples were obtained from the Maryland Brain Collection Program, which is a collaboration between

Maryland Brain Psychiatric Research Center, and Medical Examiners of the State of Maryland. Post-mortem diagnoses were done via psychological autopsies and entailed interviews with at least one family member and one friend, clinical records, and consensus diagnoses in the event of disagreement. Because of the early findings in adults, the serotonin receptor subtype 5-HT-2A was assessed in the post-mortem brains obtained from 15 teenage suicide victims (9 male) and 15 controls (12 male). The mean age (about 16) and the mean post-mortem interval (about 18.5 hours) were similar for both suicide victims and controls.

Dr. Pandey's studies reveal neuroanatomically specific alterations in the 5-HT<sub>2A</sub> receptor system for suicide victims regardless of psychiatric diagnosis. Suicide victims of all diagnoses had significant increases in receptor binding, protein levels (as measured by Western blots), and mRNA. These changes showed anatomical specificity both across and within regions. Significant increases in receptor binding, protein levels, and mRNA were observed in the prefrontal cortex (area 9) and hippocampus in suicide victims compared to controls. There were no significant changes in these measures in the nucleus accumbens. Furthermore, immunohistochemistry revealed significantly increased 5-HT-2A receptors in cortical layer V in prefrontal cortex, but not in layers III or VI, of suicide victims compared to controls. These changes were evident even in the absence of mental disorder.

***Teenage suicide appears to be driven mainly by impulsive aggressive behavior.***

*Ghanshayam Pandey*

Dr. Pandey reported post-mortem evaluation of the phosphoinositide signaling system, a second messenger system for serotonin. His studies showed significant brain changes in just one subtype of phospholipase C. He also found that there was a decrease in the phospholipase C activity in membrane and cytosol fractions of brain tissue from the adolescent suicide victims. Again, there was no difference between adolescent suicide victims with versus without a history of mental disorders. This is in striking contrast to the adult studies of this system where phospholipase C activity in the suicide victims was no different from controls.

Dr. Pandey presented data on changes in serotonin receptors in platelets in suicidal patients. In suicidal adults, platelet 5-HT-2A receptors increased significantly, regardless of type or presence of psychiatric diagnosis. Both the control and suicidal group included adults with a psychiatric diagnosis (bipolar disorder, schizo-affective disorder, or schizophrenia), or no psychiatric diagnosis. Both of these groups were compared to non-psychiatric, non-suicidal controls as well. Changes with suicidal ideation were also evaluated, and no differences were observed between suicidal ideators and attempters. Both groups showed significantly increased platelet 5-HT-2A receptor binding as compared to controls. Platelet 5-HT-2A receptor binding showed sensitivity to recency of the suicidal ideation. Only recent ideation, not a history of suicidal thoughts one month prior or longer, demonstrated the increase in receptor binding. Hence this may be a measure sensitive to current suicidality and could be developed for use in clinical settings.

## STRATEGIES TO IDENTIFY GENES FOR COMPLEX DISEASES

Dr. William Byerley's presentation reflected on the challenges faced in assessing the genetic influences on suicidal behavior. He outlined four possible scenarios for the genetic transmission of suicidal behaviors. (1) Genes for mental illness could interact with environmental influences to increase suicide risk. (2) A sub-population of the genes linked to mental illness could be directly linked to suicide. (3) A disease gene could interact with another biological factor, e.g., al

tered serotonin system. (4) The genes for protective factors could be dysfunctional in those who attempt suicide. Genetic technology to investigate these possibilities does exist, but its practical applications require further exploration.

Five issues complicate genetic research according to Dr. Byerley: (i) diagnostic issues; (ii) phenotypes which are not genotypes; (iii) genotypes which are not phenotypes; (iv) unknown mode of transmission and; (v) genetic heterogeneity. The first four problems can be addressed through experimental design for power. The fifth problem, genetic heterogeneity, is more complex. There are two types of heterogeneity: allelic and locus. In allelic heterogeneity, one or more versions of a gene cause the disease. On average, Dr. Byerley explained, one disease gene has 10 different versions. In locus (or non-allelic) heterogeneity, different genes, possibly on different chromosomes, cause the disease. In addition, both allelic and non-allelic heterogeneity can be involved in the same disorder.

A common variant can cause a complex trait, as in late onset Alzheimer's disease. Testing for the common variant-complex trait is possible with existing methods. These common variants have existed for many thousands of years, and the genetic sequences for most of them are publicly available via the internet.

Alternatively, a rare variant can cause the complex trait. For example, there can be 10 alleles, each with a frequency of 2 percent at one locus, accounting for the same effect as one gene present in 30 percent of the population. This is more challenging to research since they are rare in the population, likely have not been sequenced, and therefore are not publicly available. In the rare variant diseases, there can be high heterogeneity, with low frequencies of each variant, which collectively account for a large proportion of cases.

***The days of the single gene studies are numbered, and you have to start thinking about genome-wide studies.***

*William Byerley*

Dr. Byerley described three strategies that can be used to map genes: linkage, association, and direct search techniques. A linkage strategy maps the expression of the disease across multiple generations of families. Genetic testing of the families allows the identification of candidate genes and mutations. Linkage is a robust technique when allelic heterogeneity underlies the disorder even when faced with high numbers of variants at a single locus, but it quickly loses power when multiple loci are involved. Dr. Byerley spoke about promising data from a number of laboratories using linkage analyses to examine complex psychiatric disorders such as schizophrenia and bipolar disorder. This research indicates that the affected genes are not distributed throughout the genome, but are clustered in particular areas. However, sibling-pair studies have not been as fruitful as hoped. Dr. Byerley suggested that the outcome of linkage studies could be improved by using larger families (multi-generation families with at least 10 affected individuals) or using isolated populations where the heterogeneity is reduced compared to "out-bred" populations.

Association studies examine the frequency of a genetic marker in afflicted and control subjects across the genome. Recent findings of markers that are very frequent throughout the genome facilitate the use of this type of study. Association has more power than linkage, but is ineffective if both allelic and non-allelic heterogeneity are contributing factors. The association approach currently uses case control and family-based methods, and a genomic control method has recently been introduced. Case control studies have proven very important for the study of late-onset diseases because it is not possible to use family-based methods if both parents are not

living. The higher rate of false positives in case control studies is a minor problem compared to false negatives, which would risk missing the gene of interest. Genomic control studies combine case control and family-based approaches. This type of study has promise, but the techniques and statistics are still being developed. Genome-wide association studies are theoretically possible, but the costs are very high. Dr. Byerley estimated that one thousand cases and controls would cost \$600 million dollars to study.

Another approach is the direct search, which is a powerful method for detecting mutations. Direct search is very robust for both allelic and non-allelic heterogeneity and can identify the genetic defect in individual analyses. It requires the sequence of the candidate gene, which has been a problem in the past, but with the human genome having been sequenced, there are now many more potential candidate genes that can be used.

According to Dr. Byerley, the best current method of mutation detection is DNA sequencing with 100 percent sensitivity; other technologies are on the horizon. If a gene contributes 5 percent of the illness in the population, and 96 people are directly sequenced, the power would be 99 percent, and with 48 people, 91 percent. Some alleles will be very rare. Even at 1 percent contribution, sequencing 96 people gives a 62 percent probability of finding the gene. For example, there are about 200 serotonin-related genes that might relate to suicide. Dr. Byerley estimated that it would cost a quarter of a million dollars to do this analysis well.

Dr. Byerly concluded with the following assessments. (1) Genome-wide linkage studies testing common variant-common trait hypotheses are worthwhile. (2) Data sets exist for bipolar disorder, schizophrenia, and other disorders that are risk factors for suicide. Linkage studies of this data for suicide risk and suicide protective factors could be useful. (3) Large pedigrees should be studied. (4) Micro-array studies for the expression of variants in post-mortem tissue could be very useful. Micro-array assays are indirect, in that the results may all be down-stream changes of the disease gene, but can still be informative. (5) One affordable approach for the genetic study of suicide is to do direct DNA sequencing of all the serotonin genes in approximately 50 severely affected cases.

### NEUROBIOLOGICAL CONSEQUENCES OF CHILDHOOD ABUSE AND NEGLECT

Dr. Martin Teicher discussed his work on early childhood maltreatment as a stressor that initiates a cascade of neurohumoral and physiological responses and leads to impaired brain development. He focused on brain areas that are known to be sensitive to environmental effects during post-natal development (amygdala, hippocampus, cerebellar cortex, and corpus callosum).

Dr. Teicher observed that patients with personality disorders had symptoms suggestive of temporal lobe epilepsy, including abnormal EEGs and sometimes abnormal MRIs. These patients also had histories of childhood maltreatment. This led to his hypothesis that childhood maltreatment caused temporal lobe and limbic system brain changes. To test this, Dr. Teicher and his colleagues developed a rating scale, the Limbic System Checklist-33 (LSCL-33), to measure the frequency of temporal lobe seizure-associated symptoms. These include paroxysmal somatic disturbances (such as the feeling in the stomach of going up in an elevator), brief hallucinatory events (like smelling horrid odors, or seeing blood on the wall), visual disturbances, automatisms, and associative disturbances (such as déjà vu). An initial study of 250 consecutive adult outpatient admissions found 38, 49, and 113 percent increases in average LSCL-33 scores in those who had histories of physical, sexual, or both types of abuse, respectively.

A subsequent study assessed 115 consecutive admissions to a child and adolescent clinic. The subjects were divided into four groups: non-abused, psychologically abused, physically or sexually abused, and severely physically or sexually abused as documented by the department of social services. EEGs reflected significant increases in left-sided frontal or temporal abnormalities in all abused groups as compared to controls. The abused subjects did not differ in the prevalence of right-sided or bilateral abnormalities. The laterality of this effect was particularly true for the psychologically abused group. Neuropsychological testing corroborated the finding of more left-sided defects in abused individuals. Dr. Teicher noted a greater prevalence of self-destructive behavior, suicidal ideation, and violence in those with the abuse histories. This finding is in concert with previous studies that have identified a strong association between suicidal behavior, EEG abnormalities, and seizure disorders. Furthermore, Dr. Teicher remarked that the risk of suicide may be as much as 25 times as great in those with temporal lobe epilepsy.

Using EEG coherence to measure shared activity across brain sites, Dr. Teicher found additional support for his hypothesis. In general, high coherence of electrical activity across different brain sites indicates reduced cortical development or maturation. A comparison of 15 children with documented severe abuse to 15 healthy volunteers, all ages 6–15 and right-handed revealed a significant difference in the left side of the brain of the abused children. As expected, the healthy control children had less coherence on the left versus the right hemisphere, reflecting the increased cortical differentiation of the left hemisphere in right-handers. All abused subjects showed the opposite pattern; the right hemisphere showed less coherence. The LSCL-33 scores in these children were highly correlated with suicidal ideation. Dr. Teicher reviewed additional studies that indicate an association of early childhood abuse with diminished left hemisphere development, and a decrease in the right-left hemisphere integration.

***The risk of completed suicide is 4–5 times greater in patients with epilepsy than in patients with other medical disorders of comparable severity.***

*Martin Teicher*

To ascertain whether abnormalities in the major inter-hemispheric pathway, the corpus callosum, occur with childhood abuse, Dr. Teicher compared MRIs on 51 pediatric admissions with histories of abuse, 91 controls, and a group of hospitalized children without histories of maltreatment. The corpus callosum of the abused group was significantly smaller compared to the two control groups. For males, a history of childhood neglect was associated with reduced size of the corpus callosum, and for females, this same change was associated with a history of sexual abuse. Dr. Teicher cited other research in children and animal models that were consistent with these findings.

The last region that Dr. Teicher discussed was the cerebellar vermis. He remarked that “...abnormalities in the cerebellar vermis may be involved in a wide array of psychiatric disorders.” The cerebellum, like the cortex, corpus callosum, and hippocampus, has an extended postnatal development, and is often affected by early exposure to corticosteroids. In fact, the cerebellar vermis has the highest concentration of glucocorticoid receptors in the brain and plays a role in the control of epilepsy and limbic activation. Using a functional MRI (fMRI) procedure to assess the relationship between limbic and cerebellar vermis activity Dr. Teicher found that abused subjects (n=11) have diminished cerebral blood volumes and diminished activation of the cerebellar vermis compared to controls (n=16). These characteristics correlate with their

limbic irritability symptoms and suggest that early abuse is associated with functional deficits in the development of the cerebellar vermis.

Dr. Ming Tsuang commented that similar patterns of brain abnormalities occur in schizophrenia, which raises the question of disease specificity versus common mechanisms of stress on the brain. Dr. Teicher agreed that the significant overlap in the abnormalities in maltreated individuals and those with schizophrenia is confounding, especially since the maltreated subjects in Dr. Teicher's studies do not have schizophrenia. He speculated that the gross brain commonalities may reveal differences across disorders upon further light-microscopic neuroanatomical investigations.

***There are two components to verbal abuse. There's the criticism component and there's a yelling and screaming component Both factors exert effects, but the criticism is more severe.***

*Martin Teicher*

Dr. Teicher remarked that one of the most striking aspects of these ongoing studies is the impact of verbal abuse. Exposure to verbal aggression was quantified using a 15-item verbal abuse scale. Verbal Abuse Scores (VAS) greater than 40 were associated with elevated LSCL-33 and Dissociative Experiences Scale (DES) scores. The higher the VAS score, the higher were symptoms of depression, limbic irritability, and dissociation. This was found in subjects who had not experienced any other form of abuse, nor witnessed domestic violence. Exposure to domestic violence or verbal abuse was equally associated with dissociative symptoms to a greater extent than sexual abuse. Dr. Teicher underscored how important it is for clinicians to not jump to the conclusion that dissociative symptoms indicate a history of sexual abuse; verbal abuse, in his research, appears to be associated with a greater increase in dissociative symptoms. Dr. Teicher stated that parental verbal aggression was a sensitizing factor for traumatic life events.

The research Dr. Teicher reviewed indicates that early stress may produce limbic irritability and EEG abnormalities that are associated with self-destructive behavior, aggression, impulsivity, and suicidal ideation. A number of mechanisms may be involved in the development of limbic irritability. Among those suggested are reduced density of benzodiazepine receptors, changes in the sub-unit constitution of GABA receptors, diminished GABA transmission in the amygdala, increased amygdala release of corticotropin releasing factor to the locus coeruleus, changes in vasopressin levels, and reduced serotonin levels.

### **ASSOCIATION OF EARLY PHYSICAL OR SEXUAL ABUSE WITH SUICIDE ATTEMPTS IN BIPOLAR ILLNESS**

Dr. Robert Post spoke about the association of early physical or sexual abuse with suicide attempts in people with bipolar disorder. He focused on studies conducted on patients from The Stanley Foundation Bipolar Network, including suicidal behaviors, early and later stresses, comorbidities, and access to health care. The data discussed at this workshop came from a subset of 632 patients. About 75 percent are Bipolar I (including periods of mania), almost half of them completed college, with a fairly equal sex distribution (slightly more females). Of this group, 258 had made suicide attempts while in treatment; they were compared to the other patients who did not make suicide attempts. Analysis of this population revealed that being married was associated with a reduced suicide rate, while college education and income were negatively correlated with suicide rate.

Dr. Post reported that the rate of sexual and/or physical abuse in the bipolar patients was similar to that in the general population. But within this group, significant relationships were noted between histories of childhood abuse and suicide attempts. Whereas 25 percent of the group as a whole attempted suicide, 50 percent of those with a history of abuse did. The frequency of the abuse had differential effects on the percentage of patients who made suicide attempts, depending on the type of abuse. A linear relationship was found between the frequency of physical abuse (rarely, occasionally, or frequently) and the percentage of patients making suicide attempts, with more frequent abuse associated with high percentage making attempts. Sexual abuse, on the other hand, even when infrequent, was associated with significant increases in suicide attempts, with no apparent dose-response. The effects of physical and sexual abuse appear to be additive. Dr. John Mann observed that the rate of childhood abuse in Dr. Post's sample was not significantly different than the general population, but the rate of suicide was about 25 percent in Dr. Post's patient sample (50 percent in those abused) as compared to the U.S. national rate of approximately 0.012 percent. Dr. Mann highlighted the need to identify the reasons for this increased vulnerability whether it is a differential response in those who develop bipolar disorder, or differences in magnitude and severity of abuse. Furthermore, not all of those with bipolar disorder who were abused as children attempt suicide, underscoring the need to identify factors leading to vulnerability.

Other clinical characteristics were also associated with increased suicide risk. Those with early onset of illness (before age 14) were about 10 percent more likely to make suicide attempts. Having a history of a comorbid anxiety disorder was a significant factor. Current anxiety disorders were not significant, although they were associated with increased risk. Dr. Post also noted that the presence of personality disorders was correlated with suicide attempts. The strongest relationships were between Cluster "B" personality disorders (histrionic, narcissistic, borderline, and anti-social) with suicide attempts.

Lack of social supports tended to increase risk for suicide attempts. The death of a spouse or partner was associated with more suicide attempts. The lack of a confidant or close friend, was another important factor.

People with limited access to healthcare services or lacking insurance for mental health made more suicide attempts. Dr. Post reported the increased number of medical conditions was associated with more suicide attempts.

### PSYCHOLOGIC FACTORS IN SUICIDE

Dr. Edwin Shneidman expressed his opposition to the medicalization of suicide, which he sees as essentially a human condition. He spoke of suicide not as a disease, but as a series of acts with a common end point. Suicide does overlap at times mental illnesses, but there is "a 100% overlap between the commission of suicide and perturbation, upset, unease, anguish, discontent" along with an idea of ending it all. Dr. Shneidman described suicide as a condition that will not occur without excessive psych-ache, that is, mental pain.

The goal of the clinician is to prevent people from dying and to alleviate suffering. The key question to ask a patient who is suicidal is "where do you hurt?" The patient will not answer by pointing to a body part, but will give a story, or narrative, of anguish, hurt and perturbation. The question to follow that with should be "how may I help you?"

Through history, there have been disputes over the locus of action of suicide; it has been seen as a sin, a crime, and today it is medicalized—a disease. Dr. Shneidman said that what we need to do is emphasize the phenomenological introspective approach to suicide; in order to under

stand suicide, we need to know about the “flow of the mind.” Dr. Shneidman referred to suicide as a drama in the mind.

For those suffering from psychological pain, Dr. Shneidman prefers assessments to diagnoses. Psychological pain is difficult to discuss and define; he made a crude attempt at assessing it using the concept of projections and pictures to develop the Psychological Pain Assessment Scale. This scale uses pictures from postcards brought by his father from Czarist Russia in 1905. The person is asked to rate each picture from 1 to 9 as to the amount of mental pain in that picture of the chief protagonist, then is asked to rate the worst mental pain he has ever had and to write about it.

Dr. Shneidman spoke of different constellations of need in humans, which when frustrated or blocked, account for a large percentage of all cases of suicide. There are the modal needs that one lives with day by day, and the vital needs that one would die for. This division varies; at times some needs become prominent and more important. They include thwarted love, fractured control, assault of self-image, and ruptured relationships.

Dr. Shneidman recounted a study he conducted in the 1970s of over 50 years of data compiled by Louis Terman. Terman, a psychology professor at Stanford in the 1920s and 1930s, studied gifted children and noted a rather high rate of suicide among the sample. Shneidman examined 30 cases individually and was not told about the last 5 years of each person’s life; nor was he told which persons were living or deceased. He knew that 5 had suicided and in ranking the 30 cases for risk of suicide, had picked the 5 in the first 6 of his list. He was able to recognize common themes in the lives of the people who committed suicide which were evident many years before the act of suicide occurred. This has implications for the prevention of suicide.

Dr. Shneidman pointed out the need to study psychological needs and stressed the need for therapy to be “anodynic,” that is, to relieve the pain of the patient. Dr. Shneidman emphasized the need to fully consider the suicidal person’s perspective—that what may seem tolerable to the therapist may be totally intolerable to the patient. He also suggested that there be study on survivors of lethally intended suicide attempts. These survivors can provide valuable insight into why people commit suicide and “they are the closest to the ‘inside’ that we’ll get.” Similarly, research should be done on family members who survive someone committing suicide to see whether they are at higher risk for suicide. Dr. Shneidman also stressed the need to establish a Ph.D. program in Clinical Suicidology so that future clinicians would be properly trained and better prepared to serve suicidal persons.

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## APPENDIX A

# WORKSHOP AGENDA

March 14<sup>th</sup>, 2001  
THE NATIONAL ACADEMIES  
Beckman Center, Irvine, CA

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8:30–8:45	Remarks and introduction by chairs: W.Bunney and A.Kleinman
	<b>Topic 1: Epidemiology &amp; Measurement</b>
8:45–9:15	<i>Eve Mościcki</i> “Epidemiology of suicide”
9:15–9:45	<i>David Goldston &amp; Gregory Brown</i> “Issues in measurement”
9:45–10:30	Discussion
	<b>Topic 2: Socio-Cultural Factors</b>
10:45–11:15	<i>Ron Maris</i> “Social and culture factors in suicide risk”
11:15–11:45	Discussion
	<b>Topic 3: Biologic Factors</b>
11:45–12:15	<i>Ghanshyam Pandey</i> “Neurobiology of teenage and adult suicide: Possible biological markers for identification of suicidal patients”
12:15–12:15	<i>William Byerley</i> “Strategies to identify genes for complex diseases”
12:45–1:15	Discussion
	<b>Topic 4: Developmental Factors &amp; Trauma</b>
2:00–2:30	<i>Martin Teicher</i> “Neurobiological consequences of childhood abuse and neglect”
2:30–3:30	<i>Robert Post</i> “Association of early physical or sexual abuse with suicide attempts in bipolar illness”
3:00–3:30	Discussion
3:00–3:45	Break
	<b>Topic 5: Psychologic Factors</b>
3:45–4:15	<i>Ed Shneidman</i> “Psychologic factors in suicide”
4:15–4:45	Discussion
4:45–5:15	Closing Comments
5:15	Adjourn

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## Appendix B

### WORKSHOP SPEAKERS

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