THE EPIDEMIOLOGY OF CO-OCCURRING ADDICTIVE AND MENTAL DISORDERS: Implications for Prevention and Service Utilization

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General population data from the National Comorbidity Survey are presented on co-occurring DSM-III-R addictive and mental disorders. Co-occurrence is highly prevalent in the general population and usually due to the association of a primary mental disorder with a secondary addictive disorder. It is associated with a significantly increased probability of treatment, although the finding that fewer than half of cases with 12-month co-occurrence received any treatment in the year prior to interview suggests the need for greater outreach efforts.

Studies of diagnostic patterns both in clinical samples *(Ross, Glaser, & Germanson, 1988; Rounsaville et al., 1991; Wolf, Schubert, Patterson, Marion, & Grande, 1988)* and in general population samples *(Boyd et al., 1984; Helzer & Pryzbeck, 1988; Regier, Burke, & Burke, 1990)* show that the co-occurrence of addictive and mental disorders is highly prevalent and more common in treatment samples than in untreated community samples *(Rounsaville, Dolinsky, Babor, & Meyer, 1987; Woodruff, Guze, Clayton, & Carr, 1973)*. More detailed information is needed to understand these associations. This article helps to address that need by presenting nationally representative general population data that focus on *a)* the prevalence of co-occurring addictive and mental disorders, *b)* temporal relationships between these disorders, and *c)* the extent to which 12-month co-occurrence is associated with utilization of services. The data come from the National Comorbidity Survey (NCS) *(Kessler, McGonagle, Zhao et al., 1994)*. Unlike most articles in this section, psychosis is not included in our evaluation because of the small number of psychotics in the NCS *(Kendler, Gallagher, Abelson, & Kessler, in press)* and the extremely high comorbidity of psychosis with other mental disorders. Instead, the mental disorders that are the focus of attention are mood disorders, anxiety disorders, and antisocial personality disorders.

METHODS

Sample

As described in more detail elsewhere *(Kessler, McGonagle, Zhao et al., 1994)*, the NCS is based on a stratified, multistage

area probability sample of persons ages 15–54 in the noninstitutionalized civilian population of the 48 coterminous United States, as well as a representative supplemental sample of students living in campus group housing. Field work was carried out between September 1990 and February 1992. The response rate was 82.4%, with a total of 8,098 completed interviews.

The NCS interview was administered in two parts. Part I, administered to all respondents, included the core diagnostic interview, a brief risk-factor battery, and an inventory of sociodemographic information. Part II included a more detailed risk-factor battery and a series of diagnoses of secondary interest to the investigation. Part II was administered to a subsample of 5,877 respondents consisting of all those who screened positive for any lifetime diagnosis in Part I, all others in the age range 15–24, and a random subsample of other respondents.

Results reported in this paper are based on the Part II subsample. The data were weighted for differential probabilities of selection into the Part I sample, differential nonresponse, differential probabilities of selection into Part II across strata of the Part I sample, as well as to adjust the sample to approximate the cross-classification of the population distribution on a range of sociodemographic characteristics. These weights have been described in greater de-

tail elsewhere *(Kessler, McGonagle, Zhao et al., 1994)*.

Diagnostic Assessment

The psychiatric diagnoses included in the present report consist of *DSM-III-R (American Psychiatric Association, 1987)* affective disorders (major depressive episode, dysthymia, mania), anxiety disorders (panic disorder with or without agoraphobia, generalized anxiety disorder, simple phobia, social phobia, agoraphobia with or without panic, post-traumatic stress disorder), addictive disorders (alcohol abuse without dependence, alcohol dependence, drug abuse without dependence, other drug dependence), conduct disorder, and adult antisocial behavior.* Diagnoses were generated from a modified version of the Composite International Diagnostic Interview (CIDI) *(World Health Organization, 1990)*, a structured interview designed to be used by trained interviewers who are not clinicians. Field trials of the CIDI have documented good reliability and validity of all the diagnoses considered here *(Wittchen, 1994)*.

Analysis Procedures

The analyses of co-occurrence were carried out by estimating odds-ratios between pairs of disorders based on logistic regression models with dichotomous predictor variables using the LOGISTIC procedure

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*Both the mental and addictive disorders considered in the present report differ from those reported by Kessler, McGonagle, Zhao et al. *(1994)*. There are three changes in the mental disorders. First, post-traumatic stress disorder has been added to the anxiety disorders, based on evidence that it is highly prevalent *(Kessler, Sonnega et al., 1995)*. Second, the assessment of symptoms associated with antisocial personality disorder has been expanded to distinguish between conduct disorder (three or more types of antisocial behavior occurring prior to age 15) and adult antisocial behavior (four or more types occurring since age 15). Although both are required for a diagnosis of antisocial personality disorder, the present analysis considers these disorders separately because of recent evidence that a substantial number of respondents, women in particular, report adult antisocial behavior in the absence of conduct disorder *(Cottler, Kessler, & Nelson, 1995)*. Third, the diagnosis of nonaffective psychosis has been deleted from the present report based on evidence of low prevalence of in the NCS *(Kendler, Gallagher, Abelson, & Kessler, in press)*. As a result of these changes, the revised 12-month and lifetime estimates of the prevalence of any mental disorder are 24.0% and 43.2%, respectively, rather than the 22.7% and 35.2% reported by Kessler, McGonagle, Zhao et al. *(1994)*. There is also a change in the addictive disorders. Kessler, McGonagle, Zhao et al. *(1994)* used the CIDI convention of defining respondents as having 12-month substance dependence when they met lifetime criteria for the disorder and had one or more 12-month dependence symptoms. This has been changed to require a minimum of three 12-month dependence symptoms, the minimum specified in *DSM-III-R* as fulfilling the requirement of for a diagnosis of dependence. As a result of this change, 12-month prevalence estimates are revised to 4.5% for alcohol dependence, 1.8% for drug dependence, and 8.2% for any addictive disorder. The 12-month prevalence of addictive disorders was reported as 11.3% and the lifetime prevalence as 26.6% in the earlier report.

in the SAS software package *(SAS Institute, 1988)*. Temporal relationships were distinguished by using simple cross-tabular methods to compute the percentage of cases of a particular type in which one disorder had an earlier age of onset than the other based on retrospective self-reports. Patterns of 12-month treatment were also examined by computing cross-tabulations between diagnostic classifications and self-reports about treatment. Age-of-onset curves were calculated using the SURVIVAL procedure in the SPSS software package *(Norusis, 1990)*.

Due to the complex sample design and weighting of the NCS, special analysis procedures were required to obtain unbiased estimates of standard errors of parameter estimates. The Taylor series linearization method *(Woodruff & Causey, 1976)* was used to adjust standard errors of means for purposes of testing the significance of subsample differences in treatment prevalences. The method of Balanced Repeated Replications *(Koch & Lemeshow, 1972)*, operationalized in a SAS MACRO *(SAS Institute, 1988)*, was used to adjust standard errors of odds-ratios for purposes of testing the significance of these measures of association. Statistical tests were evaluated at the .05 level of significance using two-tailed tests and design-based standard errors.

RESULTS
Basic Patterns of Co-occurrence

Data on 12-month and lifetime co-occurrence of specific addictive and mental disorders are presented in TABLE 1 in the form of odds-ratios (ORs). Consistent with earlier research, the overall pattern of ORs is overwhelmingly positive, with 78% of the disorder-specific ORs for 12-month disorder and 80% of those for lifetime disorder positive (that is, larger than 1.0) and most of these statistically significant. All the mental disorders are consistently more strongly related to dependence than to abuse.

Table 1

12-MONTH AND LIFETIME CO-OCCURRENCE (ODDS-RATIO) OF ADDICTIVE
AND MENTAL DISORDERS

MD	12-MONTH CO-OCCURRENCE					LIFETIME CO-OCCURRENCE				
	AAWOD	AD	DAWOD	DD	ANY ADD	AAWOD	AD	DAWOD	DD	ANY ADD
Affective										
MDE	1.1	3.7*	1.6	3.6*	3.0*	1.0	2.7*	1.7*	2.8*	2.3*
DY	1.0	3.9*	1.0	1.1	2.6*	0.9	1.0*	1.3	2.5*	1.9*
Mania	0.7	6.3*	2.3	8.2*	6.7*	0.3	9.7*	1.2	8.4*	6.8*
Any	1.1	3.6*	1.4	3.9*	3.0*	1.0	2.8*	1.7*	3.0*	2.3*
Anxiety										
GAD	0.4	4.6*	1.7	1.8	3.1*	0.9	2.8*	1.5	3.8*	2.1*
PD	0.5	1.7	0.2	4.7*	2.2*	1.0	2.0*	1.6	3.8*	2.0*
PTSD	1.5	2.2*	1.5	4.2*	2.5*	0.7*	2.6*	1.6*	4.0*	2.5*
SO PH	2.3*	2.8*	1.8	3.2*	2.6*	1.2	2.2*	1.3	2.6*	2.1*
SI PH	1.2	2.2*	0.7	1.8*	1.9*	1.3	2.1*	1.2	2.5*	2.0*
AGO	1.1	2.6*	0.1	4.4*	2.5*	1.0	1.7*	0.9	2.8*	1.6*
Any	1.7*	2.6*	1.3	3.6*	2.5*	1.2	2.1*	1.4*	3.3*	2.1*
Other										
CD	—	—	—	—	—	1.9*	5.6*	2.6*	5.3*	5.3*
AAB	—	—	—	—	—	1.8*	10.5*	2.8*	13.6*	11.8*
CD and AAB	—	—	—	—	—	1.7*	11.7*	2.5*	14.2*	13.9*
CD or AAB	—	—	—	—	—	2.0*	6.7*	2.8*	7.0*	6.1*
Any Mental										
One +	1.6*	2.7*	1.5	3.6*	2.6*	1.2*	2.5*	1.6*	3.7*	2.4*

Note. MD=mental disorder; AAWOD=alcohol abuse without dependence; AD=alcohol dependence; DAWOD=drug abuse without dependence; DD=drug dependence; ANY ADD=abuse and/or dependence on alcohol and/or drugs; MDE=major depressive episode; DY=dysthymia; GAD=generalized anxiety disorder; PD=panic disorder (with or without agoraphobia); PTSD=post-traumatic stress disorder; SO PH=social phobia; SI PH=simple phobia; AGO=agoraphobia (with or without panic); CD=conduct disorder; AAB=adult antisocial behavior; CD and AAB=antisocial personality disorder; One + =one or more mental disorders.
*Odds-ratio is significantly different from 1.0 at the .05 level, using design-based standard errors.

Mania is more strongly related than any other affective disorder or anxiety disorder with both 12-month and lifetime dependence on alcohol or drugs, while conduct disorder (CD) and adult antisocial behavior (AAB) are more strongly related than the anxiety disorders or any of the affective disorders other than mania with both 12-month and lifetime abuse and dependence.

The coefficients in TABLE 2 are the conditional proportions associated with the 12-month ORs in TABLE 1. Entries in the columns labeled A are the proportions of respondents with a given 12-month addictive disorder (indicated by the column heading) who also had a particular 12-month mental disorder (indicated by the row heading). For example, the entry in the upper left corner of the table shows that 11.3% of the NCS respondents with 12-month alcohol abuse also had at least one episode of major depression during this same 12-month period. Other entries in the A columns show that, among respondents with one of the 12-month addictive disorders, 12.3%–31.7% also had a 12-month affective disorder, 24.0%–45.5% had a 12-month anxiety disorder, and 32.5%–52.8% had at least one of the mental disorders (either affective or anxiety) considered here. These proportions are consistently

lower for abuse than for dependence and highest for drug dependence. One-fourth (24.5%) of all respondents with any 12-month addictive disorder also had a 12-month affective disorder, 35.6% had a 12-month anxiety disorder, and 42.7% had at least one 12-month mental disorder.

Entries in the columns labeled M in TABLE 2 are the proportions of respondents with a given 12-month mental disorder (indicated by the row heading) who also had a particular 12-month addictive use disorder (indicated by the column heading). Among respondents with an affective disorder, 18.4%–37.1% also had at least one 12-month addictive disorder. This was also true of 13.5%–21.0% of respondents with one or more of the 12-month anxiety disorders. Respondents with 12-month mania and those with 12-month generalized anxiety disorder were more likely than those with other mental disorders to have a 12-month addictive disorder (37.1% and 21.0%, respectively).

The data in TABLE 3 are similar to those in TABLE 2, but refer to lifetime rather than to 12-month co-occurrence. As shown in that table, 41.0%–65.5% of respondents with a lifetime addictive disorder also have a lifetime history of at least one mental disorder, while 50.9% of those with one or more life-

Table 2

CONDITIONAL PROBABILITIES OF 12-MONTH CO-OCCURRENCE OF ADDICTIVE
AND MENTAL DISORDERS

MD	AAWOD		AD		DAWO		DDD		ANY ADD	
	A	M	A	M	A	M	A	M	A	M
Affective										
MDE	11.3	2.8	27.9	12.1	15.0	1.2	28.4	5.0	22.9	18.4
DY	1.1	2.6	3.6	15.1	1.1	0.8	1.2	2.0	2.4	18.8
Mania	0.3	1.8	1.9	22.4	0.9	1.8	2.7	12.9	1.7	37.1
Any	12.3	2.8	29.2	11.8	15.0	1.1	31.7	5.2	24.5	18.3
Anxiety										
GAD	1.4	1.1	11.6	16.2	5.3	1.3	5.6	3.2	8.1	21.0
PD	1.3	1.4	3.9	7.4	0.6	0.2	9.5	7.4	4.5	16.0
PTSD	5.6	3.7	7.7	8.8	5.6	1.1	13.9	6.5	8.3	17.7
SO PH	16.0	5.2	18.4	10.5	13.0	1.3	20.6	4.8	16.6	17.4
SI PH	10.6	3.1	17.0	8.6	6.2	0.6	14.8	3.1	14.5	13.5
AGO	4.2	2.7	9.1	10.4	0.4	0.1	14.3	6.7	8.4	17.7
Any	29.1	3.8	36.9	8.5	24.0	1.0	45.5	4.3	35.6	15.2
Any Mental										
One +	33.0	3.5	45.0	8.3	32.5	1.1	52.8	4.0	42.7	14.7

Note. A=addictive disorder; M=mental disorder; see Table 1 for balance of legend.

Table 3

CONDITIONAL PROBABILITIES OF LIFETIME CO-OCCURRENCE OF ADDICTIVE
AND MENTAL DISORDERS

MD	AAWOD		AD		DAWOD		DD		ANY ADD	
	A	M	A	M	A	M	A	M	A	M
Affective										
MDE	16.6	9.1	32.0	26.4	25.7	6.6	34.5	15.4	26.6	41.4
DY	2.7	8.6	6.1	28.7	3.9	5.8	6.5	16.7	4.5	40.0
Mania	0.2	3.1	2.0	61.1	0.6	5.4	2.5	40.7	1.2	71.0
Any	18.9	9.2	36.0	26.4	28.1	6.5	39.1	15.6	29.7	41.2
Anxiety										
GAD	4.6	8.4	11.0	29.8	7.5	6.3	14.9	21.9	8.3	42.3
PD	3.7	9.6	6.2	24.4	5.4	6.6	10.5	22.5	5.5	41.2
PTSD	5.2	6.5	15.1	28.1	11.6	6.8	21.7	21.9	12.9	45.2
SO PH	15.5	11.0	22.7	24.2	16.0	5.3	26.4	15.3	20.0	40.1
SI PH	13.8	11.5	19.2	24.1	12.8	5.1	22.3	15.2	17.0	40.2
AGO	6.7	9.2	10.3	21.4	6.4	4.2	15.5	17.5	9.3	36.5
Any	31.7	10.4	43.3	21.4	35.3	5.5	54.4	14.6	40.7	37.8
Other										
CD	20.9	15.1	36.2	39.3	26.8	9.1	39.4	23.2	29.1	59.5
AAB	8.5	15.4	21.3	58.3	12.4	10.6	30.3	45.0	15.3	78.7
CD and AAB	4.9	14.4	14.1	62.7	7.2	10.0	20.3	48.9	9.8	61.4
CD or AAB	24.5	15.4	43.5	40.9	32.1	9.5	49.4	25.2	34.6	82.1
Any										
One +	41.0	18.0	55.2	27.0	47.7	8.5	65.5	14.7	51.4	50.9

Note. See Tables 1 and 2 for legend.

time mental disorders also have a lifetime history of at least one addictive disorder. A much higher proportion of respondents with lifetime CD or AAB also have a lifetime addictive disorder (82.1%) than is true of respondents with a lifetime affective disorder (41.2% of whom also have a lifetime addictive disorder) or a lifetime anxiety disorder (37.8%).

Temporal Relationships
Between Lifetime Co-occurring Disorders

The distributions of first onsets of lifetime co-occurring disorders are presented in TABLE 4. Columns labeled M contain the proportions of cases with various types of mental-addictive co-occurrence in which the mental disorder was retrospectively reported to have started at an earlier age than both abuse and dependence on the substance, while columns labeled SY contain the proportions of cases in which the mental and addictive disorders were reported to have started in the same year, and columns labeled A contain the proportions in which either abuse or dependence on the substance was reported to have started prior to the mental disorders.

Results for the total sample show that, among people with a history of both a mental and an addictive disorder, the mental disorder usually occurs first. Co-occurring affective and anxiety disorders appear first in higher proportions among men than women. The only instances in which primary addictive disorders are more likely than mental disorders to occur first involve co-occurring affective disorders and alcohol use disorders among men.

The data in TABLE 5 focus on the subsample of TABLE 4 respondents who have 12-month co-occurrence of addictive and mental disorders. These respondents are, in general, more chronic and severe than those with lifetime but not 12-month co-occurrence. It is noteworthy, in this regard, that the proportions where mental disorders occur first are, in general, somewhat larger in this subsample than in the total sample of lifetime co-occurring cases.

Impact of Mental Disorders
on the Course of Addictive Disorders

In an effort to examine the possibility that lifetime co-occurrence might be associated with illness course, a series of logis-

Table 4

TEMPORAL PRIORITIES BETWEEN THE AGES OF ONSET OF LIFETIME CO-OCCURRING
ADDICTIVE AND MENTAL DISORDERS

GROUP	AAWOD			AD			DAWOD			DD			ANY ADD		
	M	SY	A	M	SY	A	M	SY	A	M	SY	A	M	SY	A
Total Sample															
Any affective	45.6	6.4	48.1	53.2	12.5	34.3	55.6	4.8	39.6	55.5	12.5	32.0	48.4	11.2	40.3
Any anxiety	77.5	3.5	18.9	81.1	4.7	14.3	77.2	4.1	18.7	84.4	3.1	12.5	79.3	4.2	16.6
CD or AAB	91.3	2.1	6.6	90.1	2.8	7.0	88.2	5.1	6.6	90.7	3.4	6.0	89.3	3.2	7.5
Any mental	82.1	2.6	15.3	85.8	4.4	9.7	79.9	5.1	15.1	90.2	1.9	8.0	83.5	3.7	12.8
Three + mental	96.7	0.7	2.6	95.7	0.7	3.6	92.7	3.1	4.2	97.4	0.9	1.7	95.2	1.1	3.7
Men															
Any affective	26.0	5.9	68.1	43.5	12.7	43.8	50.8	6.2	43.0	52.4	7.0	40.6	40.1	9.6	50.3
Any anxiety	73.2	5.2	21.6	76.7	5.3	18.0	74.3	7.8	17.9	78.2	2.7	19.1	74.2	5.4	20.3
CD or AAB	92.6	2.2	5.2	89.4	3.2	7.3	91.4	6.3	2.3	90.0	3.0	7.0	89.2	3.7	7.1
Any mental	81.9	2.5	15.7	84.2	5.0	10.9	81.2	7.3	11.4	88.7	1.4	9.9	82.3	3.9	13.8
Three + mental	94.9	1.4	4.0	93.4	1.1	5.5	97.2	1.9	0.8	96.0	1.4	2.7	93.1	1.4	5.5
Women															
Any affective	56.7	6.7	36.6	65.4	12.3	22.3	59.0	3.8	37.2	58.4	17.7	23.9	56.5	12.8	30.7
Any anxiety	81.4	2.1	16.6	87.1	3.7	9.2	78.8	2.0	19.2	90.3	3.5	6.2	84.6	2.8	12.6
CD or AAB	87.7	1.9	10.4	93.0	1.2	5.8	74.4	—	25.6	92.5	4.2	3.3	89.5	1.9	8.7
Any mental	82.4	2.9	14.7	89.1	3.4	7.5	78.3	2.5	19.3	92.3	2.6	5.2	85.2	3.5	11.3
Three + mental	97.8	0.3	1.8	99.1	—	0.9	88.9	4.0	7.1	99.1	0.4	0.6	97.4	0.8	1.7

Note. SY=same year; see Tables 1 and 2 for balance of legend.

tic regression equations was estimated in which history of mental disorders was used to predict the course of addictive disorders. Persistent course was defined for purposes of this analysis as 12-month prevalence of the addictive disorder within the subsample of lifetime cases, controlling for age of onset and number of years since onset. As shown in TABLE 6, the only earlier mental disorders found to be significantly associated with a more persistent course of sub-sequent addictive disorders are primary anxiety disorder and CD/AAB in predicting the course of alcohol dependence.

Age of Onset Distributions

The age of onset distribution for addictive disorders that occurred before any mental disorder was compared with the distributions for those that occurred after a mental disorder and those that started in the same year as a mental disorder. No signifi-

Table 5

TEMPORAL PRIORITIES BETWEEN AGE OF ONSET OF LIFETIME CO-OCCURRENCE FOR
RESPONDENTS WITH 12-MONTH CO-OCCURRENCE IN VARIOUS COMBINATIONS

GROUP	AAWOD			AD			DAWOD			DD			ANY ADD		
	M	SY	A	M	SY	A	M	SY	A	M	SY	A	M	SY	A
Total Sample															
Any Affective	50.2	8.2	41.7	57.4	14.6	28.0	98.7	—	1.3	61.4	11.9	26.7	55.0	10.5	34.5
Any Anxiety	70.2	3.2	26.6	83.3	4.3	12.4	92.8	—	7.2	82.5	5.0	12.5	76.9	3.9	19.2
Any Mental	86.7	2.7	10.6	94.4	0.4	5.2	95.7	—	5.3	90.7	1.7	7.6	89.3	1.1	9.6
Three + mental	97.5	—	2.5	100.0	—	—	100.0	—	—	100.0	—	—	100.0	—	—
Men															
Any Affective	24.0	4.4	71.7	57.7	15.1	27.2	100.0	—	—	61.0	6.0	33.0	57.6	11.5	36.9
Any Anxiety	53.5	8.6	37.9	82.1	5.8	12.1	100.0	—	—	72.5	1.4	26.2	72.6	5.6	21.8
Any Mental	73.7	2.8	23.5	95.9	0.7	3.5	100.0	—	—	87.2	2.0	10.8	87.7	0.9	11.4
Three + mental	79.9	—	20.1	100.0	—	—	100.0	—	—	100.0	—	—	90.7	—	9.3
Women															
Any Affective	65.9	10.5	23.7	56.9	13.7	29.4	97.3	—	2.7	61.6	16.8	21.6	59.1	9.4	31.5
Any Anxiety	80.3	—	19.7	85.4	1.6	13.0	84.0	—	16.0	89.2	7.4	3.4	81.6	2.0	16.4
Any Mental	95.1	2.7	2.2	91.6	—	8.4	86.4	—	13.6	93.6	1.5	4.9	91.3	1.3	7.4
Three + mental	100.0	—	—	100.0	—	—	100.0	—	—	100.0	—	—	98.4	—	1.6

Note. See preceding tables for legend.

Table 6

LOGISTIC REGRESSION COEFFICIENTS (ORs) FOR PRIMARY MENTAL DISORDERS PREDICTING THE COURSE OF ADDICTIVE DISORDERS

MENTAL DISORDERS	ADDICTIVE DISORDERS			
	AAWOD	AD	DAWOD	DD
Affective	1.2	0.8	1.6	0.9
Anxiety	1.1	1.3*	1.2	0.9
CD/AAB	1.2	2.1*	0.7	1.5

*Significant at the .05 level, two-tailed test

cant differences were found (χ^2=2.6, df=2, NS). The age of onset distribution of the earlier mental disorders associated with subsequent addictive disorders, in comparison, was found to be much earlier than the distribution of addictive disorders. These two distributions, pooled across all cohorts and combining men and women, are presented in FIGURE 1. The median age of onset of the mental disorder in this figure is 11, compared to a median age of 21 for the subsequent onset of a addictive disorder.

It is important to recognize that this summary figure fails to account for either the existence of significantly increasing prevalences of some disorders in the younger NCS cohorts *(Kessler, McGonagle, Nelson, et al, 1994; Warner, Kessler, Hughes, Anthony, & Nelson, 1995)* or for differences in the distributions of disorders depending on the sex of respondents or on which mental disorder started first and which addictive disorder followed. More detailed analyses of these subsample differences found considerable variation in the distributions, but showed consistently that *a)* the vast majority of the earlier mental disorders associated with subsequent addictive disorders have onsets in the adolescent years and *b)* the median difference between the ages of onset of these mental disorders and subsequent addictive disorders is 5–10 years.

Co-occurrence and Utilization of Services

TABLE 7 shows distributions of 12-month outpatient treatment among NCS respondents with a 12-month affective disorder or anxiety disorder separately for subsamples with and without a 12-month addictive disorder. About one-third (36.3%) of respon-

Figure 1

CUMULATIVE AGE OF ONSET DISTRIBUTIONS OF FIRST LIFETIME MENTAL DISORDER AND FIRST LIFETIME ADDICTIVE DISORDER IN RESPONDENTS WITH LIFETIME CO-OCCURRENCE OF OF A PRIMARY MENTAL DISORDER WITH A SECONDARY ADDICTIVE DISORDER
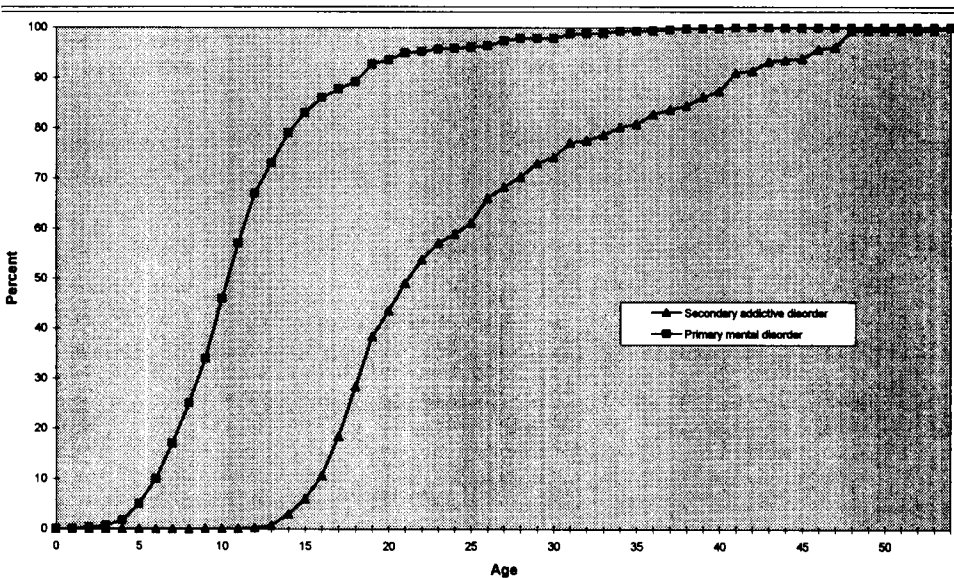
Table 7

PROBABILITIES OF 12-MONTH TREATMENT BY SERVICE SECTOR AMONG RESPONDENTS
WITH 12-MONTH AFFECTIVE AND 12-MONTH ANXIETY DISORDERS, SEPARATELY
BY CO-OCCURRENCE OF A 12-MONTH ADDICTIVE DISORDER

| | AFFECTIVE DISORDER WITH CO-OCCURRING ADDICTIVE DISORDER | | | | ANXIETY DISORDER WITH CO-OCCURRING ADDICTIVE DISORDER | | | |
| | YES | | NO | | YES | | NO | |
TREATMENT SECTOR	TS	TR	TS	TR	TS	TR	TS	TR
Specialty addictive	5.1	12.8	0.6	1.7	4.1	11.0	0.5	2.0
Specialty mental health	22.6	56.8	19.5	54.6	21.2	59.7	11.6	47.2
General medical	11.4	74.0	12.5	35.2	9.7	26.2	8.9	36.2
Human services	15.4	38.7	13.4	37.7	13.3	35.9	8.9	36.2
Self-help group	18.3	46.0	6.3	17.7	17.5	47.3	6.7	27.2
Any treatment	39.8	100.0	35.5	100.0	37.0	100.0	24.6	100.0

Note. TS= total sample; TR=treatment sample. TR column totals are greater than 100.0 because some respondents were treated in more than one service sector.

dents with a 12-month affective disorder received some type of treatment in the year prior to the NCS interview. There was no significant difference in overall probability of treatment between those affectively disordered cases with an addictive disorder (39.8% of whom were treated) and others (35.5%). There were, however, differences in sector-of-treatment in these two subsamples, with those having a co-occurring addictive disorder significantly more likely than others to receive their treatment in the specialty addictive treatment sector and the general medical sector and to attend a self-help group.* The mean number of sectors of treatment among persons with co-occurring affective disorder and addictive disorder was 2.3, compared to 1.5 among others with affective disorder.

About one-fourth (26.5%) of respondents with a 12-month anxiety disorder received treatment in the year prior to the NCS interview. Those with a co-occurring addictive disorder were significantly more than others likely to be treated (37.0% vs. 24.6%). There were also differences in sector-of-treatment, with those having a co-occurring addictive disorder significantly more likely than others with an anxiety disorder to receive their treatment in the specialty addictive treatment sector and specialty mental health sector and to attend a self-help group, but significantly less likely than others to receive their treatment in the general medical sector.

TABLE 8 shows the distributions of 12-month outpatient treatment among NCS respondents with each of the 12-month addictive disorders separately for subsamples with and without a 12-month mental disorder. In general, treatment was much less prevalent among those having alcohol abuse (AA) or drug abuse (DA) (11.6% and 12.7%, respectively) than alcohol dependence (AD) or drug dependence (DD) (28.9% and 46.8%, respectively). Among abusers, those having a co-occurring mental disorder were no more likely to be treated than were those without. Nor were they more likely to receive treatment in multiple sectors. However, they were significantly more likely than others to receive their treatment in the mental health specialty sector (78.0% of those in treat-

*The specialty substance sector includes drug or alcohol outpatient clinics. The specialty mental health sector includes treatment by a psychiatrist or psychologist in any setting other than a drug or alcohol clinic or treatment by any other professional in a psychiatric outpatient clinic. The general medical sector includes treatment by a general practitioner, family physician, cardiologist, gynecologist, or any physician other than a psychiatrist in any setting other than a drug or alcohol outpatient clinic or by any other professional in a hospital emergency department. The human services sector includes treatment by anyone other than a physician in a social service agency or in a program at a school, jail, or prison. The self-help sector includes participation in a group for problems with emotions or nerves or use of alcohol or drugs.

Table 8

PROBABILITIES OF 12-MONTH TREATMENT BY SERVICE SECTOR AMONG
RESPONDENTS WITH A 12-MONTH ADDICTIVE DISORDER, SEPARATELY
BY CO-OCCURRENCE OF A 12-MONTH MENTAL DISORDER

	ALCOHOL DISORDERS								DRUG DISORDERS							
	AAWOD WITH				AD WITH				DAWOD WITH				DD WITH			
	CO-OCCURRING MENTAL DISORDER								CO-OCCURRING MENTAL DISORDER							
	YES		NO		YES		NO		YES		NO		YES		NO	
TREATMENT SECTOR	TS	TR	TS	TR	TS	TR	TS	TR	TS	TR	TS	TR	TS	TR	TS	TR
Specialty addictive	0.0	0.0	2.2	19.6	6.7	16.3	4.0	21.1	0.0	0.0	0.8	9.9	11.5	18.2	6.8	26.4
Specialty mental health	9.6	78.0	2.8	25.0	17.1	41.5	4.7	24.7	14.4	61.0	2.4	29.6	38.9	61.6	9.2	35.8
General medical	1.2	9.8	4.3	38.4	8.5	20.6	1.5	7.9	2.9	12.3	0.8	9.9	16.1	25.5	1.7	6.6
Human services	3.3	26.8	3.7	33.0	17.2	41.7	9.5	50.0	12.7	53.8	5.1	63.0	19.0	30.1	11.7	45.5
Self-help group	1.5	12.2	2.8	25.0	24.4	59.2	10.1	53.2	3.4	14.4	1.4	17.3	26.7	42.3	14.3	55.6
Any treatment	12.3	100.0	11.2	100.0	41.2	100.0	19.0	100.0	23.6	100.0	8.1	100.0	63.1	100.0	25.7	100.0

Note. See prior tables for legend.

ment among cases with AA and a mental disorder and 61.0% of those in treatment among cases with DA and a mental disorder, compared to 25.0% and 29.6%, respectively, among other cases in treatment), significantly less likely to receive their treatment in the specialty addictive treatment sector (0% of both alcohol and drug abusers with a mental disorder, compared to 19.6% of others in treatment with AA and 9.9% of others in treatment with DA) and, among those with AA, significantly less likely than others to receive their treatment in the general medical sector (9.8% compared to 38.4% among others in treatment) or to attend a self-help group (12.2% compared to 25.0% of others in treatment).

Among respondents with 12-month substance dependence, those having a mental disorder were significantly more likely than others to be treated (41.2% of those with AD and 63.1% of those with DD compared to 19.0% and 25.7%, respectively, of others with these disorders) and slightly more likely to be treated in multiple sectors. They were also significantly more likely than others to receive their treatment in the specialty mental health sector (41.5% of those in treatment with AD and 61.6% of those in treatment with DD, compared to 24.7% and 35.8%, respectively, of others in treatment with these disorders) and the general medical sector (20.6% of those in

treatment with AD and 25.5% of those in treatment with DD, compared to 7.9% and 6.6%, respectively, of others in treatment with these disorders).

DISCUSSION

Differences Between
NCS and ECA Prevalence Estimates

The NCS estimates of the proportions of the population with various types of addictive-mental co-occurrence are higher than those found in the NIMH Epidemiological Catchment Area (ECA) study *(Regier et al., 1990).* This is largely due to the fact that the NCS finds higher prevalences of individual disorders than the ECA *(Kessler, McGonagle, Zhao et al., 1994).* Differences in the estimated proportions of co-occurrence among cases are smaller. For example, the NCS found that 51% of those with a lifetime addictive disorder also had a lifetime mental disorder, compared to 38% in the ECA.

NCS-ECA prevalence estimate differences might be due to the fact that the two studies differed a great deal in design. For example, the NCS was based on a nationally representative sample, while the ECA was based on a sample of five local areas. The NCS sample was limited to the household population, while the ECA included supplemental samples of the institutionalized population. The NCS sample had a limited age range (15–54), while the ECA sample had an unrestricted age range.

Collaborative investigations of discrepancies in the NCS and ECA prevalence estimates, which are currently in progress, have also documented two other important reasons for differences in prevalence estimates. First, pilot work for the NCS led to a revision in the structure of the CIDI, aimed at increasing the effort made by respondents to recall lifetime occurrence of disorders. This revision consisted of consolidating the diagnostic stem questions for all the NCS anxiety and affective disorders into a lifetime review section administered early in the interview. Experimental analysis indicated that this modification resulted in a significant increase in the proportion of respondents who endorsed the diagnostic stem questions and this, in turn, resulted in a significant increase in the estimated prevalence of both morbidity and co-occurrence of multiple disorders. Ongoing validity studies of the NCS data suggest that this modification increased the validity of NCS lifetime prevalence data *(Wittchen, Kessler, Zhao, & Abelson, 1995).*

Second, a number of modifications were made to the Diagnostic Interview Schedule (DIS) during the 15 years since it was first developed for use in the ECA *(Robins, Helzer, Croughhan, & Ratcliff, 1981).* Many of these modifications were taken over in the development of the CIDI *(World Health Organization, 1990),* the instrument used in the NCS. A number of these modifications led to higher prevalence estimates than in the original DIS.

Temporal Relationships
Between Lifetime Co-occurring Disorders

The NCS findings are clear in showing that the vast majority of people with lifetime co-occurrence between an NCS/*DSM-III-R* addictive disorder and mental disorder had at least one mental disorder occur at an earlier age than their first addictive disorder. Consistent with parallel research using retrospective age-of-onset reports in clinical samples, this pattern is strongest for co-occurrences involving conduct disorder *(Cadoret, Troughton, & Widmer, 1984; Hesselbrock, 1986),* next strongest for those involving anxiety disorders *(Hesselbrock, Meyer, & Keener, 1985; Weiss & Rosenberg, 1985),* and least strong (and, among men, reversed) for those involving affective disorders *(Jaffe & Ciraulo, 1986; Lewis, Rice, & Helzer, 1983).* It is important to recognize that retrospective recall bias could be involved in these results and that it is, therefore, necessary to turn to longitudinal studies for confirmation.

In the case of the temporal relationship between conduct disorder and addictive disorders, the evidence is fairly clear, even though there is overlap in the symptoms of these disorders *(Bukstein, Brent, & Kaminer, 1989).* McCord and McCord *(1960),* for example, found in a long-term prospective study that childhood aggressiveness preceded alcohol use and predicted later development of alcoholism. Jones *(1975)* found much the same results in a long-term follow-up of respondents from the Oakland Growth Study. Similar associations were found in other long-term longitudinal studies by Robins *(1966)* and Kellam, Stevenson, and Rubin *(1983).*

The data concerning the temporal relationship between anxiety and addictive disorders are a good deal more mixed, in comparison *(Schuckit & Hesselbrock, 1994).* Data from the ECA study show what appears to be an increasing risk of drug abuse disorders among respondents in the 18–30 age range who reported the prior existence of an anxiety disorder. However, little evidence of elevated rates of anxiety disorders of relatives has been found in family studies of substance-abusing probands *(Hesselbrock, 1986; Mirin, Weiss, & Michael, 1986),* although a family-history study of patients with agoraphobia or panic disorder found that alcohol abuse and dependence were elevated in the male relatives of patients compared to the relatives of controls *(Noyes et al., 1986).* Nor have longitudinal population surveys documented strong evidence for an association between early anxiety and the

subsequent onset of addictive disorders *(Hagnell & Tunvia, 1972; Vaillant, 1983).*

It is important to note, in the context of this mixed evidence, that most primary anxiety disorders in the NCS are phobias. Both the NCS and many of the previous epidemiologic studies that examined temporal relationships between phobias and addictive disorders put the age of onset at the first fear of phobic situations rather than at first meeting full diagnostic criteria for phobia. It is possible that an assessment of the latter would lead to different conclusions concerning the temporal relationships between anxiety disorders and addictive disorders. Although clinical studies might be expected to provide valid data of this sort, such studies often rely on retrospective patient reports that are subject to the same sort of bias *(De Ruiter, Rijken, Garssen, van Schaik, & Kraaimaat, 1989).*

Interestingly, the same argument can be used to suggest that the weaker evidence for a consistent temporal relationship between earlier affective disorders and subsequent addictive disorders might be underestimated. Bukstein, Brent, and Kaminer *(1989)* made this case by arguing that many substance abusers who are diagnosed as secondary depressives are, in fact, primary depressives who have difficulty dating the onset of their initial depressions correctly. Consistent with this suggestion, a report from the ECA study that focused on young people (ages 18–30) in order to avoid retrospective recall bias found that those with symptoms of both affective disorder and an addictive disorder almost always reported that their depression began at an earlier age than their substance use problems *(Christie et al., 1988).* The same result was obtained by Deykin, Levy, & Wells *(1987)* in a sample of college students. Indirect evidence consistent with the same temporal order has been found by Johnston and O'Malley *(1986)* in their longitudinal national surveys of substance abuse among high school students. Their results are consistent with the well-estab-lished finding that adolescent-onset depressions have a high risk of developing secondary substance abuse problems *(McGlashan, 1989).*

Impact of Lifetime Co-occurrence on Course of Illness

As noted at the outset, there is considerable evidence both from treatment studies *(Hirschfeld, Hasin, Keller, Endicott, & Wunder, 1990)* and from longitudinal community studies *(Hagnell & Grasbeck, 1990; Murphy, 1990)* that co-occurring psychiatric disorders are more chronic than pure psychiatric disorders. Consistent with this evidence, the NCS found that earlier anxiety disorders and CD/AAB predict the course of subsequent alcohol dependence in the NCS. However, other mental-addictive disorder patterns involving an earlier mental disorder and subsequent addictive disorder were not associated with a significantly increased probability of chronicity.

It is important to recognize that effects of co-occurrence on the course of a psychiatric disorder have also been documented when the co-occurring condition is a medical illness rather than another psychiatric disorder *(Keitner, Ryan, Miller, Kohn, & Epstein, 1991).* This raises the question of whether it is co-occurrence that affects illness course or whether co-occurrence is merely indicative of a more serious condition *(Kovacs, 1990; Merikangas, Prusoff, & Weissman, 1988).* A related question is whether the effect of co-occurrence is due to seriousness of a primary disorder or to some unmeasured common cause such as environmental adversity or genetic predisposition. No systematic research has been done to explore this issue, although several large, long-term prospective data sets are available for this purpose *(Angst, Vollrath, Merikangas, & Ernst, 1990; Hagnell & Grasbeck, 1990; Murphy, 1990).*

At the same time, a result that is inconsistent with the notion that severity of the focal disorder explains the putative effects of co-occurrence on illness course is that

some types of co-occurrence are more important than others in predicting the course of a focal disorder. For example, the fact that earlier conduct disorder and antisocial adult behavior are more important than other mental disorders in predicting the subsequent course of alcohol dependence could be due, at least in part, to a disinhibiting effect of substance use *(Menuck, 1983; Tardiff, Gross, & Messner, 1981)*. Consistent with this interpretation, epidemiologic evidence documents that the spontaneous remission commonly found among people with antisocial behavior patterns in the age range 30–40 *(Guze, 1975; Robins, 1966)* is less likely to occur among those with dependence on alcohol or other drugs *(Goodwin, Crane, & Guze, 1971)*.

Even if the accuracy of the retrospective results concerning temporal ordering is provisionally accepted, it is important to recognize a widely neglected fact: that the existence of an aggregate temporal relationship between two significantly correlated lifetime disorders does not prove that the earlier disorder is necessarily a significant predictor of the later one, nor, even if it *is* a significant predictor, that it is a stronger predictor of the later disorder than the later disorder is of the earlier disorder *(Kessler, 1995)*. In order to document predictive power, it is necessary to estimate survival equations in which the earlier disorder is treated as a time-varying covariate of the later one *(Kessler, McGonagle et al, in press)*. This complex type of statistical modeling is currently being carried out in the NCS data, but results are not yet available.

Finally, it is important to recognize that neither temporal order nor prediction can be taken to imply causal priority. It is possible that a temporally prior psychiatric disorder directly influences the onset of other disorders. Or a temporally prior disorder might indirectly influence the onset of the later disorder, as in the case where substance abuse occurs as an unintended consequence of self-medicating a mental disorder or as a result of participating in deviant peer groups *(Meyer, 1986)*. However, it is also possible that some third variable is a common cause of co-occurring disorders and that the temporal priority between these disorders is due to differences in their typical ages of manifestation resulting from the common cause. Possible common causes include community context, stress, lack of social support, and genetic predisposition *(National Institute of Mental Health, 1993)*.

Co-occurrence and Service Utilization

The NCS results are consistent with those from the ECA study in showing that 12-month co-occurrence of addictive and mental disorders is associated with an increased probability of obtaining treatment. The most dramatic effects are found among respondents having 12-month substance dependence. In the absence of a co-occurring 12-month mental disorder, only 19% (AD) and 26% (DD) of these people received any of the broadly defined types of treatment considered here during the 12 months prior to the NCS interview, compared to 41% (AD) and 63% (DD) of those with a co-occurring mental disorder who received treatment.

It is unclear whether these effects are due to mental disorders promoting treatment or to the existence of mental disorders being indicative of more severe addictive disorders *(Merikangas et al., 1988)*. Whichever is the case, the evidence is clear that patients with addictive disorders have a very high probability of carrying an additional diagnosis of a mental disorder and that this is due to co-occurrence of these disorders being associated with increased chances of obtaining treatment. In the NCS sample, 55% of the cases with alcohol dependence and 69% of those with drug dependence who received treatment in a specialty substance abuse clinic during the 12 months prior to the interview also had at least one 12-month affective or anxiety disorder. Although there is good reason to think that

some fraction of these co-occurring mental disorders are organic brain syndromes that are caused by the effects of substance dependence and that will clear with abstinence *(Kranzler & Liebowitz, 1988)*, the evidence concerning the high proportion of cases in which affective and anxiety disorders are primary lifetime conditions suggests that there are also many instances in which these disorders need to be treated as independent disorders.

A high prevalence of 12-month co-occurring addictive and mental disorders can also be found in other service sectors. Indeed, only a minority of these patients are treated in specialty addictive treatment clinics (in the NCS sample, 0% of those in treatment with co-occurring substance abuse, 28% of those with co-occurring AD, and 23% of those with co-occurring DD). One in four patients in specialty mental health treatment with an affective disorder and one in five of those in treatment with an anxiety disorder also have a co-occurring addictive disorder. One possible reason for the fact that no patients with co-occurring mental disorder and substance abuse were found in specialty addictive treatment clinics is that their substance use problems were minor in relation to their mental disorders, in which case they presumably selected themselves into sectors of treatment other than specialty addiction treatment. It is also possible, though, that patients of this type are refused treatment by some specialty addiction clinics and referred elsewhere for treatment of their mental disorder.

Clinical Implications

These results have a number of implications for treatment. Perhaps the most obvious is that special assessment and treatment procedures are needed for patients who present with co-occurring addictive and mental disorders, a variety of which are discussed in other papers in this special section. In addition, clinicians should routinely consider the possibility of a co-oc-

curring disorder among patients presenting for treatment of either a mental or an addictive disorder. Among patients with only one type of disorder, furthermore, clinicians should be aware that these patients are at increased risk of the subsequent occurrence of later disorders of another type, making them prime candidates for preventive interventions.

Finally, the high prevalence of 12-month mental-substance co-occurrence has important implications for the design of managed care plans. There is currently an artificial separation between mental health and addictive treatment funding schemes at the federal level. There is also considerable interest on the part of several state Medicaid programs in managed care plans that separately carve out mental health and substance abuse management and treatment. Such schemes require individuals who have co-occurring addictive and mental disorders to be classified as having either a primary mental illness or a primary addictive disorder and discourage treatment for disorders that are not considered primary. The findings reported in the present paper suggest strongly that this kind of separation of services is not in the best interests of the patient.

REFERENCES

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders (3rd ed., rev.)*. Washington, DC: Author.

Angst, J., Vollrath, M., Merikangas, K.R., & Ernst, C. (1990). Comorbidity of anxiety and depression in the Zurich Cohort Study of Young Adults. In J.D. Maser & C.R. Cloninger (Eds.), *Comorbidity of mood and anxiety disorders* (pp. 123–138). Washington, DC: American Psychiatric Press.

Boyd, J.H., Burke, J.D. Jr., Gruenberg, E., Holzer, C. E., Rae, D.S., George, L.K., Karno, M., Stoltzman, R., McEvoy, L., & Nestadt, G. (1984). Exclusion criteria of DSM-III: A study of co-occurrence of hierarchy-free syndromes. *Archives of General Psychiatry, 41,* 983–989.

Bukstein, O.G., Brent, D.A., & Kaminer, Y. (1989). Comorbidity of substance abuse and other psychiatric disorders in adolescents. *American Journal of Psychiatry, 146,* 1131–1141.

Cadoret, R., Troughton, E., & Widmer, R. (1984). Clinical differences between antisocial and primary alcoholics. *Comprehensive Psychiatry, 25,* 1–8.

Christie, K.A., Burke, J.D. Jr., Regier, D.A., Rae, D. S., Boyd, J.H., & Locke, B.Z. (1988). Epidemiologic evidence for early onset of mental disorders and higher risk of drug-abuse in young-adults. *American Journal of Psychiatry, 145*, 971–975.

Cottler, L.B., Kessler, R.C., & Nelson, C.B. (1995). *Antisocial personality disorder in the National Comorbidity Survey.* Manuscript submitted for publication.

De Ruiter, C., Rijekn, H., Garssen, B., van Schaik, A., & Kraaimaat F. (1989). Comorbidity among the anxiety disorders. *Journal of Anxiety Disorders, 3*, 57–68.

Deykin, E.Y., Levy, J.C., & Wells, V. (1987). Adolescent depression, alcohol and drug abuse. *American Journal of Public Health, 76*, 525–531.

Goodwin, D.W., Crane, J.B., & Guze, S.B. (1971). Felons who drink: An eight-year follow-up. *Quarterly Journal of Studies on Alcohol, 32*, 136–147.

Guze, S.B. (1975). The validity and significance of the clinical diagnosis of hysteria (Briquet's syndrome). *American Journal of Psychiatry, 32*, 138–141.

Hagnell, O., & Grasbeck, A. (1990). Comorbidity of anxiety and depression in the Lundby 25-year prospective study: The pattern of subsequent episodes. In J.D. Maser & C.R. Cloninger (Eds.), *Comorbidity of mood and anxiety disorders* (pp. 139–152). Washington, D.C.: American Psychiatric Press.

Hagnell, O., & Tunvia, K. (1972). Prevalence and nature of alcoholism in a total population. *Social Psychiatry, 7*, 190–201.

Helzer, J.E., & Pryzbeck, T.R. (1988). The co-occurrence of alcoholism with other psychiatric disorders in the general population and its impact on treatment. *Journal of Studies on Alcohol, 49*, 219–224.

Hesselbrock, M.N. (1986). Childhood behavior problems and adult antisocial personality disorder in alcoholism. In R.E. Meyer (Ed.), *Psychopathology and addictive disorders.* New York: Guilford Press.

Hesselbrock, M.N., Meyer, R.E., & Keener, J.J. (1985). Psychopathology in hospitalized alcoholics. *Archives of General Psychiatry, 42*, 1050–1055.

Hirschfeld, R.M.A., Hasin, D., Keller, M.B., Endicott, J., & Wunder, J. (1990). Depression and alcoholism: Comorbidity in a longitudinal study. In J.D. Maser & C.R. Cloninger (Eds.), *Comorbidity of mood and anxiety disorders* (pp. 293–304). Washington, DC: American Psychiatric Press.

Jaffe, J.H., & Ciraulo, D.A. (1986). Alcoholism and depression. In R.E. Meyer (Ed.), *Psychopathology and addictive disorders.* New York: Guilford Press.

Johnston, L.D., & O'Malley, P.M. (1986). Why do the nation's students use drugs and alcohol? Self-reported reasons from nine national surveys. *Journal of Drug Issues, 16*, 29–66.

Jones, M.C. (1975). Personality correlates and antecedents of drinking patterns in adult males. *Journal of Consulting and Clinical Psychology, 36*, 27.

Keitner, G.I., Ryan, C.E., Miller, I..W., Kohn, R., &

Epstein, N.B. (1991). 12-month outcome of patients with major depression and comorbid psychiatric or medical illness (compound depression). *American Journal of Psychiatry, 148*, 345–350.

Kellam, S.G., Stevenson, D.L., & Rubin, B.R. (1983). How specific are the early predictors of teenage drug use? In L.S. Harris (Ed.), *Problems of drug dependence, 1982: NIDA Research Monograph 43.* Rockville, MD: National Institute on Drug Abuse.

Kendler, K.S., Gallagher, T.J., Abelson, J., & Kessler, R.C. (in press). Lifetime prevalence, demographic risk factors and diagnostic validity of nonaffective psychosis as assessed in a U.S. community sample: The National Comorbidity Survey. *Archives of General Psychiatry.*

Kessler, R.C. (1995). The epidemiology of psychiatric comorbidity. In M. Tsaung, M. Tohen, & G. Zahner (Eds.), *Textbook of psychiatric epidemiology* (pp. 179–197). New York: Wiley.

Kessler, R.C., McGonagle, K.A., Carnelley, K.B., Nelson, C.B., Farmer, M.E., & Regier, D.A. (in press). Comorbidity of mental disorders and substance use disorders: A review and agenda for future research. In P. Leaf (Ed.), *Research in Community and Mental Health.* Greenwich, CT: JAI Press.

Kessler, R.C., McGonagle, K.A., Nelson, C.B., Hughes, M., Swartz, M., & Blazer, D.G. (1994). Sex and depression in the National Comorbidity Survey II: Cohort effects. *Journal of Affective Disorders, 30*, 15–26.

Kessler, R.C., McGonagle, K.A., Zhao, S., Nelson, C. B., Hughes, M., Eshleman, S., Wittchen, H.-U., & Kendler, K.S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: Results from the National Comorbidity Survey. *Archives of General Psychiatry, 51*, 8–19.

Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C.B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52*, 1048–1060..

Koch, G.G., & Lemeshow, S. (1972). An application of multivariate analysis to complex sample survey data. *Journal of the American Statistical Association, 67*, 780–782.

Kovacs, M. (1990). Comorbid anxiety disorders in childhood-onset depression. In J.D. Maser & C.R. Cloninger (Eds.), *Comorbidity of mood and anxiety disorders* (pp. 271–282). Washington, D.C.: American Psychiatric Press.

Kranzler, H.R., & Liebowitz, N.R. (1988). Anxiety and depression in substance abuse: Clinical implications. *Medical Clinics of North America, 72*, 867–885.

Lewis, C.E., Rice, J., & Helzer, J.E. (1983). Diagnostic interactions: Alcoholism and antisocial personality. *Journal of Nervous and Mental Diseases, 171*, 105–113.

McCord, W., & McCord, J. (1960). *Origins of Alcoholism.* Stanford, CA: Stanford University Press.

McGlashan, T.H. (1989). Comparison of adolescent- and adult-onset unipolar depression. *American Journal of Psychiatry, 146*, 1208–1211.

Menuck, M. (1983). Clinical aspects of dangerous

behavior. *Journal of Psychiatry Law*, *11*, 227–304.

Merikangas, K.R., Prusoff, B.A., & Weissman, M.M. (1988). Parental concordance for affective disorders: Psychopathology in offspring. *Journal of Affective Disorders*, *15*, 279–290.

Meyer, R.E. (1986). *Psychopathological and Addictive Disorder*. New York: Guilford.

Mirin, S.M., Weiss, R.D., & Michael, J. (1986). Family pedigree of psychopathology in substance abusers. In R.E. Meyer (Ed.), *Psychopathology and addictive disorders* (pp. 57–77). New York: Guilford Press.

Murphy, J.M. (1990). Diagnostic comorbidity and symptom co-occurrence: The Stirling County study. In J.D. Maser & C.R. Cloninger (Eds.), *Comorbidity of mood and anxiety disorders* (pp. 153–176). Washington, D.C.: American Psychiatric Press.

National Institute of Mental Health. (1993). *The prevention of mental disorders: A national research agenda.* Rockville, MD: Author.

Norusis, M.J. (1990). *SPSS Advanced statistics user's guide.* Chicago: SPSS, Inc.

Noyes, R., Crowe, R.R., Harris, E.L., Hamra, B.J., McChesney, C.M., & Chaudhry, D.R. (1986). Relationship between panic disorder and agoraphobia. *Journal of Clinical Psychiatry*, *49*, 441–442.

Regier, D.A., Burke, J.D. Jr., & Burke, K.C. (1990). Comorbidity of affective and anxiety disorders in the NIMH Epidemiologic Catchment Area Program. In J.D. Maser & C.R. Cloninger (Eds.), *Comorbidity of mood and anxiety disorders* (pp. 113–122). Washington, D.C.: American Psychiatric Press.

Robins, L.N. (1966). *Deviant children grown up: A social and psychiatric study of sociopathic personality.* Baltimore: William and Wilkins.

Robins, L.N., Helzer, J.E., Croughhan, J., & Ratcliff, K.L. (1981). National Institute of Mental Health Diagnostic Interview Schedule: Its history, characteristics and validity. *Archives of General Psychiatry*, *38*, 381–389.

Ross, H.E., Glaser, F.B., & Germanson, T. (1988). The prevalence of psychiatric disorders in patients with alcohol and other drug problems. *Archives of General Psychiatry*, *45*, 1023–1031.

Rounsaville, B.J., Anton, S.F., Carroll, K., Budde, D., Prusoff, B.A., & Gawin, F. (1991). Psychiatric diagnosis of treatment-seeking cocaine abusers. *Archives of General Psychiatry*, *48*, 43–51.

Rounsaville, B.J., Dolinsky, Z.S., Babor, T.F., & Meyer, R.E. (1987). Psychopathology as a predictor of treatment outcome in alcoholics. *Archives of General Psychiatry*, *44*, 505–513.

SAS Institute. (1988). *SAS 6.03.* Cary, NC: Author.

Schuckit, M.A., & Hesselbrock, V. (1994). Alcohol dependence and anxiety disorders: What is the relationship? *American Journal of Psychiatry*, *151*, 1723–1734.

Tardiff, K., Gross, E., & Messner, S. (1981). A study of homicide in Manhattan. *American Journal of Public Health*, *76*, 139–143.

Vaillant, G.E. (1983). *The Natural History of Alcoholism.* Cambridge, MA: Harvard University Press.

Warner, L.A., Kessler, R.C., Hughes, M., Anthony, J.C., & Nelson, C.B. (1995). Prevalence and correlates of drug use and dependence in the United States: Results from the National Comorbidity Survey. *Archives of General Psychiatry*, *52*, 219–229.

Weiss, K.J., & Rosenberg, D.J. (1985). Prevalence of anxiety disorder among alcoholics. *Journal of Clinical Psychiatry*, *46*, 3–5.

Wittchen, H.-U. (1994). Reliability and validity studies of the WHO-Composite International Diagnostic Interview (CIDI): A critical review. *Journal of Psychiatric Research*, *28*, 57–84.

Wittchen, H.-U., Kessler, R.C., Zhao, S., & Abelson, J. (1995). Reliability and clinical validity of UM-CIDI DSM-III-R generalized anxiety disorder. *Journal of Psychiatric Research*, *29*, 95–110.

Wolf, A.W., Schubert, D.S.P., Patterson, M.B., Marion, B., & Grande, T.P. (1988). Associations among major psychiatric diagnoses. *Journal of Consulting and Clinical Psychology*, *56*, 292–294.

Woodruff, R.S., & Causey, B.D. (1976). Computerized method for approximating the variance of a complicated estimate. *Journal of the American Statistical Association*, *71*, 315–321.

Woodruff, R.A. Jr., Guze, S.B., Clayton, P.J., & Carr, D. (1973). Alcoholism and depression. *Archives of General Psychiatry*, *28*, 97–100.

World Health Organization. (1990). *Composite International Diagnostic Interview (Version 1.0).* Geneva: Author.