# Depression, Disability Days, and Days Lost From Work in a Prospective Epidemiologic Survey

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We describe the relationship of depression and depressive symptoms to disability days and days lost from work in 2980 participants in the Epidemiologic Catchment Area Study in North Carolina after 1 year of follow-up. Compared with asymptomatic individuals, persons with major depression had a 4.78 times greater risk of disability (95% confidence interval, 1.64 to 13.88), and persons with minor depression with mood disturbance, but not major depression, had a 1.55 times greater risk (95% confidence interval, 1.00 to 2.40). Because of its prevalence, individuals with minor depression were associated with 51% more disability days in the community than persons with major depression. This group was also at increased risk of having a concomitant anxiety disorder or developing major depression within 1 year. We conclude that the threshold for identifying clinically significant depression may need to be reevaluated to include persons with fewer symptoms but measurable morbidity. Only by changing our nosology can the societal impact of depression be adequately addressed.

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THERE is growing evidence that persons with depression suffer from a number of functional limitations, including poorer physical, psychosocial, and role functioning, and an increased number of disability days.[1-9] A recent report from the Medical Outcomes Study by Wells et al[10] demonstrates that these functional impairments are present in patients with depressive symptoms in the absence of a depressive disorder as well as in those with major depressive disorder. If patients with minor depressions have persistent functional impairments that are not self-limiting, then treatment of some type may be indicated. This article addresses the relationship between depressive symptoms and disability over time.

**For editorial comment see p 2549.**

Current standards championed in the primary care literature in the United States[11,12] rely on the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition* (*DSM-III-R*)[13] and do not adequately incorporate the minor depressive rubrics of Research Diagnostic Criteria[14] or other classification systems,[15] or Snaith's[16] concept of mild depression. Nevertheless, primary care physicians, who take care of about half of all patients with depression in this country,[17] are in some circumstances diagnosing persons with depressive symptoms who do not meet *DSM-III-R* criteria for major depression and are treating them with tricyclic antidepressants.[18-22] These persons do not meet criteria easily for other mood disorders, such as dysthymia and adjustment disorder with depressed mood. Meanwhile, Paykel et al[22,23] recently described the lack of effect of amitriptyline hydrochloride in minor depression.

While many primary care physicians relate the experience of treating a patient with mild or minor depression, the clinical characteristics of this group of patients have not been rigorously described. Surveys of primary care practices indicate a prevalence in the range of 5.7% to 11.2% for minor depression or other depressive disorders that would not be diagnosed if *DSM-III-R* criteria were applied.[24-26] Patients who have some depressive symptoms but who do not have the requisite number for a diagnosis of major depression may present with a series of somatic complaints,[27,28] with mixed anxiety depression[25,29] or with a masked depression.[25] Primary care physicians commonly recognize and treat such functionally impaired patients, but these physicians have no established criteria for making a diagnosis. And, because of a lack of research using established criteria for minor depression, they have no scientifically based guidelines for the treatment of these patients.

Studies by Wells et al[10] and others are limited by cross-sectional data and a lack of control for psychiatric illness and other psychosocial variables that might affect disability. If minor depression is self-limited, functional disabilities should resolve spontaneously and may not require treatment. Likewise, if other psychiatric illness, poor social support, or severe life stress is present, functional disability may be due to factors other than depression. We address these issues by using a follow-up period long enough for mild self-limiting adjustment disorders to resolve. We broaden our assessment of the societal impact of depression by including "days lost from work" as an outcome that was not available in the Wells et al study. Finally, we control for psychiatric and medical comorbidity as well as social support and life stress, which might affect disability days or depressive symptoms.

## MATERIALS AND METHODS

### Study Sample

The study sample consisted of 3798 community residents who participated in the North Carolina Component (Piedmont Health Survey) of the Epidemiologic Catchment Area Program sponsored by the National Institute of Mental Health. Subjects were sampled from segments of a five-county area in the North Central Piedmont region of North Carolina, which were selected to represent the demographic characteristics of the population living in the five counties based on their race, rural-urban residence, and socioeconomic status. Elderly residents were systematically oversampled. Households were randomly sampled within each segment, and one adult was randomly selected from each household. There were 3015 respondents in the community sample and an additional 906 elderly in the oversample; 3798 usable interviews remained after excluding 80 proxy respondents, 37 incomplete interviews, and six interviews in which the research team thought the interviews were unre-

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liable. The final response rate was 79%. The original interviews took place in 1982 to 1983 (Wave I), and follow-up interviews were conducted approximately 1 year later (Wave II). The analyses for this article were restricted to the 2980 community residents at Wave I who completed the 1-year Wave II follow-up interview. This reflects an 83% response rate adjusted for mortality. Detailed descriptions of the Epidemiologic Catchment Area Program and the Piedmont Health Survey are published elsewhere.[30,31]

### Measurements

Each participant in the survey at Wave I underwent a 2-hour interview including the Diagnostic Interview Schedule (DIS),[32] which was scored to reflect *DSM-III* symptoms. Symptoms were counted only if they met the severity criteria of the DIS and were not explained by medical illness, medication, or drug or alcohol use, and had been experienced within the past 6 months. In addition, symptoms of crying spells and feeling hopeless were included because of their frequent association with depression.

The 2980 community residents were grouped into five categories: (1) major depression—those suffering from a DIS/*DSM-III* major depression including double depression within the past 6 months; (2) dysthymia—those suffering from a DIS/*DSM-III* diagnosis of dysthymia (lifetime diagnosis) but who did not have major depressive disorder; (3) minor depression with mood disturbance—those suffering from one or more symptoms of depression, one of which had to include depressed mood or anhedonia, but excluding major depression or dysthymia; (4) minor depression without mood disturbance—persons with one or more symptoms of depression excluding depressed mood, anhedonia, major depression, or dysthymia; and (5) asymptomatic—those with no DIS/*DSM-III* symptoms of depression during the 6 months prior to the baseline interview.

Participants in the follow-up interviews (Wave II) were asked four questions pertaining to disability. These included the number of days within the past 3 months in which the respondent missed work due to illness, was late to work, spent all or part of the day in bed, or was kept from usual activities due to feeling ill. For this study, a disability day is defined as one in which a person spent all or part of the day in bed due to illness or was kept from usual activities due to feeling ill. We analyzed data on days missed from work due to illness separately.

The presence of an anxiety disorder at Wave I was defined as a 6-month prevalence of one or more of the following diagnoses as derived from the DIS: obsessive-compulsive disorder, agoraphobia with panic attacks, agoraphobia without panic attacks, social phobia, somatization, and panic attacks. Generalized anxiety disorder was not assessed at Wave I.

Control variables measured at Wave I included the sum of 12 medical conditions as reported by the respondents; the presence or absence of alcohol abuse, schizophrenia, and somatization as determined by the DIS; rural-urban status as determined by the county of residence, race, age, sex, marital status, socioeconomic status (SES) quartiles, stressful life events, social support, and physical and instrumental activities of daily living at Wave I; and stressful life events at Wave II. An SES score was calculated based on education and household income using methods previously described.[30,31] Social support was assessed by three qualitative subscales of the Duke Social Support Index,[33] which has shown previous associations with recovery from depression.[34,35]

### Analyses

All calculations used a weighting system to account for the household probability selection, response rate, demographic characteristics, and the elderly oversample of the 196 790 persons in the five-county area who were aged 18 years or older. Only weighted values are reported in the text and tables.

Logistic regression analyses were performed with the presence or absence of disability days at Wave II as the dependent variable. The five categories were recoded in terms of four dummy variables with asymptomatic individuals as the reference category. A multivariate model was constructed controlling the demographic, comorbidity, and psychosocial variables described in the previous section.

The complex sampling design required a Taylor series linearization procedure and logistic regression to estimate the proper variances and covariances for statistical testing of regression coefficients.[36]

Finally, odds ratios were calculated for the various depressive categories by exponentiation of the regression coefficients.

## RESULTS

Demographic characteristics did not vary significantly between the Wave I respondents and those who completed Wave II.

In Table 1, comparisons with the asymptomatic group revealed a few findings worth noting. The persons in the minor depression without mood disturbance category were less likely to be middle-aged than the asymptomatic group. The female predominance of depression was clearly exhibited across all depressive categories as well as the higher prevalence of persons not married.

Persons with minor depression were more likely to be nonwhite, of lower SES, and unemployed compared with the asymptomatic group.

While the major depressive group had a mean of 5.22 symptoms (SD, 2.97), the dysthymia group had 2.13 symptoms (SD, 2.26). The minor depression with mood disturbance group had an intermediate number of symptoms (3.31; SD, 1.97) and persons with minor depression without mood disturbance had the lowest value (1.61; SD, 0.99). The asymptomatic group had no symptoms of depression, by definition.

Table 2 further characterizes the depressed groups by demonstrating the prevalence of anxiety disorders among them. Note that even those in the minor depressive categories have a significant prevalence of anxiety disorders; persons in the major depression category have the highest prevalence, and the prevalence in the minor depression with mood disturbance category is even greater than in the dysthymia category.

Table 3 shows a comparison of Wave I status with five depressive categories at Wave II. Just over one third of the major depressive group became asymptomatic, one fourth remained depressed at the level of major depression, and almost 40% fell into the minor depression groups. Minor depression with mood disturbance followed a similar pattern, with most persons improved, but 10% developed major depression. Those in the minor depression without mood disturbance group had the best prognosis, with less than 2% who developed major depression and only 5.6% who developed mood disturbance. The overall incidence of major depression was 1.8%. The onset of dysthymia in 2.02% of persons with minor depression without mood disturbance after 1 year is inconsistent with the *DSM-III* definition of dysthymia requiring 2 years of depressed mood. We believe this may be an artifact of the DIS and inconsistencies in recall by the subjects.

Table 4 demonstrates numbers of disability days during the 90-day period prior to Wave II. For example, persons with major depression had 571 disability days, which is 475 days in excess of

Table 1.—Demographic Characteristics of Asymptomatic Community Residents and Four Categories of Depressed Individuals (N = 2980)*†

| | Asymptomatic, n (%) (N = 1997) | DIS/*DSM-III* Major Depressive Disorder, n (%) (N = 49) | DIS/*DSM-III* Dysthymia, n (%) (N = 62) | Minor Depression With Mood Disturbance, n (%) (N = 176) | Minor Depression Without Mood Disturbance, n (%) (N = 696) |
|---|---|---|---|---|---|
| Age, y | | | | | |
| 18-44 | 806 (55.4) | 28 (67.1) | 28 (57.7) | 83 (61.9) | 283 (60.4)§ |
| 45-59 | 339 (23.5) | 10 (21.6) | 14 (26.7) | 36 (24.5) | 88 (16.1) |
| ≥60 | 852 (21.1) | 11 (11.3) | 20 (15.6) | 57 (13.6) | 325 (23.5) |
| Race‡ | | | | | |
| White | 1296 (63.8) | 27 (55.7) | 44 (67.7) | 90 (50.7)§ | 440 (60.2) |
| Nonwhite | 699 (36.2) | 22 (44.3) | 18 (32.3) | 86 (49.3) | 255 (39.9) |
| Sex | | | | | |
| M | 866 (50.2) | 10 (20.5)§ | 10 (21.7)§ | 45 (32.7)§ | 231 (37.4)§ |
| F | 1131 (49.8) | 39 (79.5) | 52 (78.3) | 131 (67.3) | 465 (62.6) |
| Marital status | | | | | |
| Married | 1127 (63.9) | 23 (55.0) | 21 (45.4)§ | 68 (48.1)§ | 339 (54.2)§ |
| Unmarried | 870 (36.1) | 26 (45.0) | 41 (54.6) | 108 (51.9) | 357 (45.8) |
| Residence | | | | | |
| Rural | 1093 (48.1) | 18 (27.4)§ | 32 (46.3) | 81 (41.2) | 337 (41.5)§ |
| Urban | 904 (51.9) | 31 (72.6) | 30 (53.7) | 95 (58.9) | 359 (58.5) |
| SES quartiles‡ | | | | | |
| 1 | 512 (18.0) | 11 (11.4) | 18 (20.5) | 72 (34.2)§ | 229 (21.6)§ |
| 2 | 598 (31.1) | 18 (36.6) | 21 (36.4) | 51 (30.9) | 209 (33.5) |
| 3 | 569 (31.5) | 14 (39.1) | 15 (27.8) | 37 (27.3) | 185 (32.5) |
| 4 | 316 (19.5) | 5 (12.8) | 8 (15.3) | 16 (7.6) | 70 (12.5) |
| Employment status (Wave II) | | | | | |
| Employed | 1149 (69.8) | 25 (55.4)‖ | 36 (70.4) | 88 (55.7)§ | 341 (61.9)§ |
| Unemployed | 848 (30.2) | 24 (44.7) | 26 (29.6) | 88 (44.3) | 355 (38.1) |

*DIS indicates Diagnostic Interview Schedule; *DSM-III, Diagnostic and Statistical Manual of Mental Disorders, Third Edition;* and SES, socioeconomic status.
†Each depressive subtype was compared with asymptomatic using $\chi^2$ statistics. Percentages are weighted.
‡Missing frequencies.
§$P<.01$.
‖$P<.05$.

Table 2.—Frequencies and Percentages of One or More Anxiety Disorders During the 6 Months Preceding Wave I of the Epidemiologic Catchment Area Survey in North Carolina by Depression Category (N = 2980)

| Depression Category at Wave I | ≥1 Anxiety Disorder, n (Weighted %) |
|---|---|
| Asymptomatic | 88 (4.44) |
| Major depression | 23 (44.14)* |
| Dysthymia | 12 (19.38)* |
| Minor depression with mood disturbance | 38 (23.66)* |
| Minor depression without mood disturbance | 87 (10.83)* |

*$\chi^2$ statistics were conducted between the indicated depression category and asymptomatic; $P<.001$.

Table 3.—Percentage* of Persons With Major Depression and Minor Depression With and Without Mood Disturbance at Wave I With Five Possible Depressive Outcomes at Wave II

| | Wave I Status | | |
|---|---|---|---|
| Wave II Status | Major Depression (N = 49) | Minor Depression With Mood Disturbance (N = 176) | Minor Depression Without Mood Disturbance (N = 696) |
| Asymptomatic | 35.43 | 37.24 | 65.11 |
| Major depression | 23.65 | 10.27 | 1.79 |
| Dysthymia | 2.55 | 2.36 | 2.02 |
| Minor depression with mood disturbance | 17.57 | 15.96 | 5.60 |
| Minor depression without mood disturbance | 20.79 | 34.17 | 25.48 |

*Weighted percentages.

what would be predicted for an equal number of asymptomatic individuals. These excess disability days comprise 5.6% of the 8447 disability days for the entire sample. Similarly, the 52 excess days in the dysthymia group make up 0.6% of all disability days. Those persons with minor depression with mood disturbance had 716 excess disability days or 8.5% of all disability days. Minor depression without mood disturbance accounted for 1370 excess days or 16%. The largest portion of disability days (46%) occurred in the asymptomatic group.

Similar calculations for employed persons revealed that the excess days lost from work expressed as a percentage of all days lost from work were 2.0% for depression, 2.0% for dysthymia, 7.4% for minor depression with mood disturbance, and 10.8% for minor depression without mood disturbance.

Table 5 displays odds ratios for one or more disability days calculated using logistic regression to control for the demographic, comorbidity, and psychosocial variables previously described. The risk of disability for major depression is 4.78 times more likely than for asymptomatic individuals. The risk of disability for dysthymia is not statistically significant. This may be a result of the low number of individuals in this category; the odds ratio of 1.55 for minor depression with mood disturbance is in a similar range and is statistically significant. Minor depression without mood disturbance has the weakest association and is not statistically significant. Employed persons with major depression were 4.36 times as likely to have a disability as asymptomatic individuals. They were 3.15 times as likely to miss time from work, but this was not a statistically significant result. There was no apparent significantly increased risk of disability days or days missed from work in the employed group for the other depressive categories.

## COMMENT

Our data show that depression is a significant precursor to disability days for up to 1 year. Major depression carries the greatest risk of disability days and days lost from work, but minor depression (depressive symptoms in the absence of major depression or dysthymia) has a significant risk of disability

Table 4.—Number of Disability Days During the 90 Days Preceding Wave II of the Epidemiologic Catchment Area Survey in North Carolina

| Depression Category at Wave I | Disability Days* (N=2957†) | | | |
|---|---|---|---|---|
| | N | Sum | Mean* | SD |
| Asymptomatic | 1997 | 3917 | 1.97 | 10.73 |
| Major depression | 49 | 571 | 11.02 | 28.95 |
| Dysthymia | 62 | 173 | 3.01 | 7.49 |
| Minor depression with mood disturbance | 176 | 1059 | 6.06 | 21.37 |
| Minor depression without mood disturbance | 696 | 2727 | 4.04 | 16.29 |

*Weighted data.
†N not equal to total sample due to missing values.

Table 5.—Odds Ratios (OR)* for Risk of One or More Disability Days and One or More Days Missed From Work During the 90 Days Preceding Wave II of the Epidemiologic Catchment Area Survey in North Carolina

| Depression Category at Wave I | Entire Sample (N=2980) | Employed Respondents Only (N=1639) | |
|---|---|---|---|
| | Disability Days OR (95% CI)† | Disability Days OR (95% CI) | Days Missed OR (95% CI) |
| Major depression | 4.78 (1.64-13.88) | 4.36 (1.20-15.88) | 3.15 (0.77-12.82) |
| Dysthymia | 1.85 (0.29-11.89) | 0.88 (0.02-3.31) | 1.01 (0.09-11.55) |
| Minor depression with mood disturbance | 1.55 (1.00-2.40) | 1.26 (0.68-2.34) | 0.93 (0.48-1.81) |
| Minor depression without mood disturbance | 1.27 (0.94-1.70) | 1.34 (0.93-1.94) | 0.99 (0.68-1.46) |

*Odds ratios are relative to the asymptomatic group and are calculated from a logistic regression model controlling for race, sex, age, marital status, sum of 12 medical conditions, the presence or absence of three other *Diagnostic and Statistical Manual of Mental Disorders, Third Edition*, psychiatric disorders, rural-urban status, socioeconomic status quartiles, stressful life events, social support, physical and instrumental activities of daily living at Wave I, and stressful life events at Wave II.
†CI indicates confidence interval.

days if accompanied by mood disturbance. Minor depression with mood disturbance, because of its prevalence, may account for 51% more disability days than major depression (716 excess disability days for minor depression with mood disturbance vs 475 excess disability days for major depression).

Our findings beg for a second look at the study in which Stoudemire and colleagues[37] demonstrated the dramatic cost of major depression to society, without including the potentially great societal impact of minor depression. The disability days experienced by persons with minor depression are a sign of dysfunction that may manifest itself to society in several ways, including decreased productivity at work and increased health care utilization, though our data do not clearly support that minor depression affects lost time from work. We believe that our data provide sufficient evidence of the need to include minor depression in future assessments of the cost of depression.

Contrary to the distinct differences in disability days and other parameters we found between the major depression and minor depression groups, Wells et al[10] reported an almost equal number of days in bed in the depressive disorder and depressive symptoms groups among general medical patients. We think this discrepancy may be due to an artifact of the definition of our study groups. We used *DSM-III* criteria for major depression, whereas Wells et al enhanced the sensitivity of the DIS by requiring one less Criteria B symptom to make the diagnosis for major depression. The greater difference in severity between persons with major depression and minor depression in our study vs the Medical Outcome Study may explain the discrepancies between the findings of the two studies.

We anticipated two potential problems with our minor depression categories and tried to address them in our analyses. First, they might represent too lax a definition of depression, which might include large numbers of persons with symptoms but no dysfunction. Second, the symptoms we were dealing with are so mild that any indication of "minor depression" may be merely a transitory reaction with depressed mood due to stressful life events or chronic stress.

We addressed these issues both in our definitions of minor depression and in the design of our analyses. First, we allowed for two definitions of minor depression: the more rigorous definition required accompanying mood disturbance, and the second one did not. As it turns out, minor depression without mood disturbance was not significantly related to disability and was so common as to be difficult to classify as a disease; it is not likely to be a useful diagnostic category. Second, we controlled for Wave I and Wave II stressful life events and comorbid psychiatric disorders at Wave I to decrease the likelihood that disability at Wave II was the result of a generalized stress state or another psychiatric disorder. And third, as we have implied, our longitudinal analyses decreased the likelihood that minor depression with depressed mood was an adjustment disorder, because its effects are not transient, but persist for up to 1 year. The majority of persons with minor depression with mood disturbance had persistent depressive symptoms at Wave II. This, too, is not consistent with an adjustment reaction. There is a much lower proportion of persistent depressive symptoms in persons with minor depression without mood disturbance, suggesting that this latter group is phenomenologically different from the minor depression with mood disturbance group.

We found that 10% of minor depressive individuals with mood disturbance at Wave I proceeded to major depression by Wave II, and that almost 40% of major depressive individuals at Wave I were not asymptomatic, but were in one of the minor depressive groups (17.6% with mood disturbance, 20.8% without) by Wave II. This suggests that minor depression is a heterogeneous group. That is, some of these individuals may have a mild or minor depression; others may have major depression at various stages of exacerbations or remissions. Furthermore, longitudinal studies of these groups will be necessary to assess the extent of this heterogeneity and its clinical significance.

It is no surprise to find concomitant anxiety disorders in all the depressed groups. However, the comparative rates of individuals with anxiety disorders make minor depression with mood disturbance look more similar to major depression than dysthymia or minor depression without mood disturbance. And it suggests that almost one fourth of persons who fall into this category may have mixed-anxiety depression, a commonly described problem in psychiatric[38] and primary care[25,39] patients.

We found that minor depression with mood disturbance was more frequent among nonwhites, persons of lower SES, or those who are unemployed. Helzer et al[40] have demonstrated that the DIS used in this study tended to underdetect major depression in patients who just missed meeting *DSM-III* criteria by having one too few symp-

toms. For example, the number of depressive symptoms in our minor depression with mood disturbance group was only about 1 SD lower than major depression. If demographic differences in subjects' interpretations and response to the DIS account for the demographic differences we found in this survey, then many of the individuals we classified as having minor depression with mood disturbance may indeed be diagnosed as having major depression in clinical settings. This raises questions about our current (*DSM-III-R*) classification system using standardized interviews, such as the DIS, which would omit these people.

Clinical recommendations should only be made with caution from a community survey. Nevertheless, we can say that patients with one or more *DSM-III* symptoms of depression with mood disturbance, but who do not have major depression or dysthymia, are likely to be at risk of suffering some disability from these symptoms over a prolonged period.

Patients who might fall into these categories certainly may need to be observed, but there is little known about what to do for them. Klerman et al[41] have shown the benefit of brief psychosocial counseling by nurse practitioners for psychosocial problems in general. Certainly, primary care physicians diagnose depression in patients who do not meet *DSM-III* criteria and in many cases treat them with tricyclic antidepressants.[18-21] However, Paykel et al[22,23] have found no benefit from the use of amitriptyline hydrochloride in minor depression, and further work is necessary to sort out treatment options for this group. As Snaith[16] has pointed out, we do not yet know how to distinguish those individuals with minor depression who would respond to treatment from those who would not.

Future research in this area is needed to evaluate further the effects of minor depression on the individual. We need to examine the effects and associations of various individual depressive symptoms and various definitions of mixed-anxiety depression. Prospective studies will reduce the effects of the multiple confounders that are seen in cross-sectional studies. Clinical trials of tricyclic antidepressants and nonpharmacological interventions may be warranted if there is further evidence of functional disability in persons with minor depression and if reproducible criteria can be identified.

Diagnostic criteria for persons with depressive symptoms who do not fall under current definitions of major depressive disorder need to be established and evaluated. When such criteria are developed, we can estimate the true burden of depression on the individual and society. Only after such criteria are established can we begin to scientifically evaluate the diagnosis and treatment of the full spectrum of depressive disorders seen in medical practice. Only then will the non–psychiatrist physician have the tools to manage one of the most common problems seen in his or her practice.

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