Effects of Depression on Work Loss and Disability Bed Days in Individuals With Diabetes

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Diabetes is highly prevalent in the U.S. and is associated with significant disability and increased health care costs (1–3). Depression is also highly prevalent and is a leading cause of disability, work place absenteeism, diminished or lost productivity, and increased use of health care resources (4,5). Coexisting depression occurs in 10–30% of people with diabetes, and people with diabetes have twofold increased odds of having depression compared with people without diabetes (6,7).

The objectives of this study were to determine *1*) the effect of coexisting depression on mean work loss and disability bed days and *2*) the effect of coexisting depression on odds of extended (defined as ≥7 days) work loss and disability bed days in individuals with and without diabetes. It was hypothesized that coexisting depression in people with diabetes would be associated with significant increases in mean disability days and odds of extended disability days.

RESEARCH DESIGN AND
METHODS — Data from the sample adult core of 1999 National Health Interview Survey (NHIS) (8) were analyzed. The NHIS is a nationally representative household survey of U.S. adults aged ≥18 years. The sample is selected by a complex sampling design involving stratification, clustering, and multistage sampling, with a nonzero probability of selection for each person. Final weights allow estimates from the NHIS to be generalized to the adult civilian population of the U.S. (9).

Work loss days were defined as days in which a person missed work at a job or business because of illness or injury (2,3). Disability bed days were defined as days in which a person was kept in bed for more than one-half of the day due to illness or injury (2,3). Diagnosis of diabetes was based on self-report. Diagnosis of depression was based on the Composite International Diagnostic Interview Short Form (CIDI-SF). The CIDI-SF is a valid and reliable diagnostic interview and has classification accuracy of 93% for major depressive disorders (10). Details on CIDI-SF questions, the diagnostic algorithm, and scoring as used in the 1999 NHIS have been previously reported (7). Twelve-month prevalence estimates are reported.

A multilevel variable that defined four mutually exclusive disease categories was created. The four categories were diabetes alone, depression alone, both conditions, and neither condition. Additional comorbidity was defined as self-reported diagnosis of asthma, hypertension, coronary artery diseases, congestive heart failure, stroke, chronic obstructive pulmonary disease, cancer, end-stage renal disease, chronic liver disease, and chronic arthritis (rheumatoid arthritis, osteoarthritis, or arthritis due to gout) and were categorized as 0, 1, 2, or ≥3 conditions. Demographic variables included age, sex, race/ethnicity, education, employment, household income, census region, and BMI.

Statistical analysis was performed with Stata version 7.0 (11). Ordinary least-squares multiple regression equations were used to model work loss and disability bed days as a function of the four-level disease variable, controlling for age, sex, race/ethnicity, education, income, region, BMI, and number of chronic conditions. Adjusted least-square means were calculated for work loss and disability bed days for each disease category. Estimates for disability bed days were stratified by employment. Post hoc comparisons of adjusted means were performed and significance (*P*) values were adjusted with the Bonferroni method. In addition, multiple logistic regression was used to model the likelihood of extended (≥7) work loss and disability bed days as a function of the four-level disease variable, controlling for age, sex, race/ethnicity, education, income, region, BMI, number of chronic conditions, and employment (for disability bed days model only).

RESULTS — Of 30,801 adults who completed the 1999 NHIS, yielding a 70% response rate, 30,022 had complete data and were included in the analysis. Of these, 26,376 had neither condition, 1,852 had depression, 1,624 had diabetes, and 170 had both conditions. Table 1 shows adjusted mean work loss days and disability bed days (stratified by employment status). Post hoc comparisons (corrected with the Bonferroni method) showed that only the depression group significantly differed from neither condition. Mean disability bed days differed by employment status across the four disease categories. Post hoc comparisons showed

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Table 1—Adjusted mean work loss and disability bed days

| Disorder | Work loss days | Disability bed days | |
		Employed	Unemployed
n		20,706	9,316
Neither condition	4.5 (4.0–5.1)	2.2 (2.0–2.4)	6.5 (5.4–7.6)
Depression	13.2 (10.5–15.8)*	7.9 (6.3–9.4)*	33.2 (25.4–40.9)*
Diabetes	6.3 (4.0–8.7)	3.5 (2.2–4.8)	8.5 (5.1–11.8)
Both conditions	13.1 (4.9–21.3)	23.4 (4.9–21.3)	45.8 (25.2–66.3)*

Data are means (95% CI). Work loss days and disability bed days are adjusted for age, sex, race/ethnicity, education, income, census region, BMI, and number of additional chronic conditions. Proportion of variance (R^2) explained by the models is as follows: work loss days = 3%, disability bed days (employed) = 5%, and disability bed days (unemployed) = 10%. *Significant *P* values (means compared with neither condition and adjusted for multiple post hoc comparisons with Bonferroni method).

that only the depression group differed from neither condition among the employed, whereas the depression and both condition groups differed from neither condition among the unemployed.

Table 2 shows the adjusted odds of extended (≥7) work loss or disability bed days by specific disorder. Individuals with depression (odds ratio [OR] 3.08, 95% CI 2.56–3.69), diabetes (1.50, 1.16–1.91), or both conditions (3.25, 1.69–6.23) had increased odds of having ≥7 work loss days compared with the reference group (individuals with neither condition). Similar results were seen for the adjusted odds of extended disability bed days: depression (4.00, 3.45–4.60), diabetes (1.63, 1.36–1.95), or both conditions (5.61, 3.62–8.69).

CONCLUSIONS — This study shows that coexisting depression in people with diabetes is associated with significant increases in mean disability bed days, especially among the unemployed. In addition, it shows that coexisting depression increases the odds of extended work loss and extended disability bed days in adults with diabetes. The results of this study build on the findings of an earlier study (12), which showed that coexisting depression had synergistic effects on odds of functional disability in people with diabetes. In combination, these studies show that coexisting depression in people with diabetes is associated with increased disability burden and lost productivity.

Work loss and disability bed days seem to capture different aspects of the burden of disability. Although work loss days capture the disability burden of only those with employment, disability bed days seem to capture the disability burden for both employed and unemployed individuals. Estimates of disability bed days stratified by employment (Table 2) status showed that both employed and unemployed individuals had disability bed days. However, the unemployed had significantly higher adjusted mean disability bed days. This finding suggests that estimates of disability burden that include both work loss and disability bed days are likely to give a more comprehensive picture of the overall burden of disability for any given condition. Limitations of this study include the inability to directly attribute disability days to the specified disease categories, unavailability of reliable data on chronic disease duration, disease

severity, or comorbid psychiatric conditions, and inability to differentiate type 1 from type 2 diabetes.

References
1. National Institute of Diabetes and Digestive and Kidney Diseases: *National Diabetes Statistics Fact Sheet: General Information and National Estimates on Diabetes in the United States, 2003*. Bethesda, MD, U.S. Department of Health and Human Services, National Institutes of Health, 2003
2. Songer TJ: Disability in diabetes. In *Diabetes in America*. 2nd ed. Bethesda, MD, National Diabetes Data Group, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, 1995, p. 259–282 (NIH publ. no. 95-1468)
3. American Diabetes Association: Economic costs of diabetes in the U.S. in 2002. *Diabetes Care* 26:917–932, 2003
4. Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR, Rush AJ, Walters EE, Wang PS, National Comorbidity Survey Replication: The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA* 289:3095–3105, 2003
5. U.S. Department of Health and Human Services: *Mental Health: A Report of the Surgeon General*. Rockville, MD, U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health, 1999
6. Anderson RJ, Freedland KE, Clouse RE, Lustman PJ: The prevalence of comorbid depression in adults with diabetes: a meta-analysis. *Diabetes Care* 24:1069–1078, 2001
7. Egede LE, Zheng D: Independent factors associated with major depressive disorder in a national sample of individuals with diabetes. *Diabetes Care* 26:104–111, 2003
8. National Center for Health Statistics: *Dataset Documentation, National Health In-*

Table 2—Adjusted odds of extended (≥7) work loss and disability bed days

Disorder	Work loss days*	Disability bed days†
n	2,299	2,776
Neither condition	1.00 (1.00–1.00)	1.00 (1.00–1.00)
Depression	3.08 (2.56–3.69)	4.00 (3.45–4.60)
Diabetes	1.50 (1.16–1.91)	1.63 (1.36–1.95)
Both conditions	3.25 (1.69–6.23)	5.61 (3.62–8.69)

Data are OR (95% CI). *Adjusted for age, sex, race/ethnicity, education, income, census region, BMI, and number of additional chronic conditions; †Adjusted for age, sex, race/ethnicity, education, income, census region, BMI, number of additional chronic conditions, and employment.

terview Survey, 1999 [machine-readable data file and documentation]. Hyattsville, MD, National Center for Health Statistics, 2002

9. National Center for Health Statistics: *NHIS Survey Description, National Health Interview Survey, 1999* [machine-readable documentation]. Hyattsville, MD, National Center for Health Statistics, 2002

10. Kessler RC, Andrews G, Mroczek D, Utsun TB, Wittchen HU: The World Health Organization's Composite International Diagnostic Interview Short-Form (CIDI SF). *Int J Methods Psychiatr Res* 7:171–185, 1997

11. StataCorp: *Stata Statistical Software: Release 7.0.* College Station, TX, Stata, 2001

12. Egede LE: Diabetes, major depression, and functional disability among U.S. adults. *Diabetes Care* 27:421–428, 2004