Diabetes Differentially Affects Depression and Self-Rated Health by Age in the U.S.

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OBJECTIVE—To determine whether the relationship between age and physical and mental health varies by diabetes status in older U.S. adults.

RESEARCH DESIGN AND METHODS—Using data from the National Social Life, Health, and Aging Project, a national sample of 3,005 adults aged 57–85 years, we tested the significance of the interaction between age and diabetes in association with health states.

RESULTS—Respondents with diabetes in the youngest age cohort had more medical conditions than those without diabetes, a difference that narrowed with age (P for interaction <0.01). The youngest cohort with diabetes had a higher rate of depression compared to those without diabetes (14 vs. 8%). Depression declined with age and did not differ by diabetes status in the oldest respondents ($P = 0.01$ for age-diabetes interaction).

CONCLUSIONS—Diabetes differentially affects self-rated overall health and depression by age, with convergence in the oldest age-group with and without diabetes.

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Individualizing care of type 2 diabetes (1), particularly for older patients (2), has become a priority. Age influences the diabetes phenotype and therefore parameters guiding individualization of care. Earlier-onset type 2 diabetes is often more severe and insulin deficient (3,4), has a higher relative and absolute risk of mortality (5), and allows more time for complications to develop (6). Age also influences patient-specific illness perception. Older patients often have less diabetes-related distress than younger ones (7).

Our goal in this report was to determine whether diabetes differentially impacts physical and mental health by age. We hypothesized that diabetes would have a greater impact on self-reported physical and mental health in middle age than in old age comparing persons with diabetes with those without diabetes within age cohorts.

RESEARCH DESIGN AND METHODS

We obtained permission to use data from the National Social Life, Health, and Aging Project (NSHAP), a national area probability sample of community-dwelling Americans age 57–85 years. Detailed in-home interviews of respondents selected from the U.S. population in a stratified random sample were conducted in English and Spanish in 2005–2006. Of 4,017 eligible subjects, 3,005 participated (75.5%). Survey methods and procedures have previously been described (8). The institutional review boards of the University of Chicago and the National Opinion Research Center approved the NHSAP protocol; the Partners HealthCare Institutional Review Board deemed this analysis exempt.

Demographic information and medical conditions were obtained by self-report (9). Diabetes diagnosis was based on an affirmative response to the following question: "Has a medical doctor ever told you that you have . . . diabetes or high blood sugar?"

Outcome variables included comorbidity score, depression, and self-rated physical and mental health. The comorbidity score summed available self-reported conditions excluding diabetes (9). Symptoms of depression were assessed using an 11-item version of the Center for Epidemiological Studies-Depression (CES-D) scale in which a score of ≥9 indicates depression (10,11). Physical health and mental health were self-rated as excellent, very good, good, fair, or poor; responses were dichotomized into poor and fair versus good, very good, and excellent. Health status relative to peers was rated much better, somewhat better, about the same, somewhat worse, or much worse, with responses dichotomized into somewhat and much worse versus about the same, somewhat better, and much better.

All analyses were conducted using SAS software, version 9.2 (SAS Institute, Cary, NC) with statistical procedures (proc surveymeans, proc surveyfreq, and proc surveyreg) that accounted for the complex sampling design using weights to adjust for the probabilities of being selected to participate in the study and of not responding based on demographic and survey stratification characteristics. We tested the significance of the interaction of age-group and diabetes for each outcome variable.

RESULTS

Details of demographic and clinical characteristics of the cohort can be found in Supplementary Table 1. The total comorbidity score tended to increase in both groups with age, but among subjects with diabetes the score started from a higher baseline and rose less steeply, showing a significant interaction between diabetes and age-group ($P = 0.02$) (Fig. 1*A*). The CES-D score decreased with age among diabetes respondents and increased

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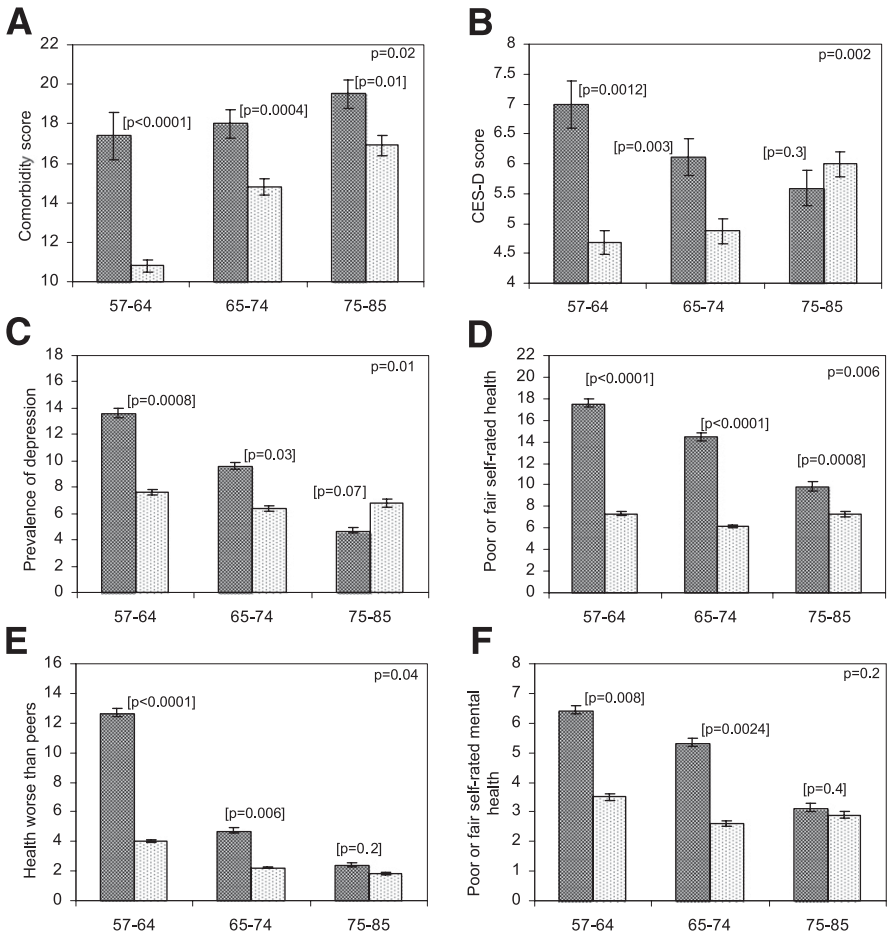

Figure 1—A–E: *Comorbidity score, depression score, and self-rated health by diabetes status and age-group. Dark bars represent respondents with diabetes. Light bars represent respondents without diabetes. Numbers on the* x*-axis denote age-group in years. Brackets indicate the* P *value for the difference between respondents with and without diabetes within each age-group. The* P *value in the upper right-hand corner of each panel is for the interaction between diabetes status and age for each variable. For* A *and* B*, error bars indicate SEs.* A*: Comorbidity score, exluding diabetes.* B*: CES-D score, where ≥9 indicates depression. For the remaining panels* (C–F)*, error bars indicate 95% CIs.* C*: Prevalence of depression.* D*: Prevalence of "poor" or "fair" self-rated overall health.* E*: Prevalence of self-rated health relative to people "your age" as "Much worse" or "Somewhat worse."* F*: Prevalence of "Poor" or "Fair" self-rated mental health.*

with age among respondents without diabetes, converging among respondents in the oldest age-group (*P* for difference between diabetes and nondiabetes in the oldest age-group = 0.31; *P* for age-diabetes interaction = 0.002) (Fig. 1*B*); results were similar when CES-D score was dichotomized to indicate depression (Fig. 1*C*).

The relationships between self-rated physical health, health relative to peers, and mental health by diabetes status and age are shown in Fig. 1*D–F* with the *P* value for the crude interaction term. Among respondents with diabetes, 18% rated their physical health fair or poor in the 57–64 years age-group, decreasing to only 10% of the oldest age group, while 6–7% of respondents without diabetes rated their health fair or poor across all age-groups (*P* = 0.006 for age-diabetes interaction) (Fig. 1*D*). Health status relative to peers showed a more pronounced pattern (*P* for difference between diabetes and nondiabetes in the oldest age-group = 0.16; *P* for age-diabetes interaction = 0.04) (Fig. 1*E*). Poor or fair self-rated mental health showed a similar pattern, though the age-diabetes interaction was not significant (Fig. 1*F*).

In multivariable models predicting depression and poor or fair self-rated physical health, the interaction between diabetes and age was significant after adjustment for sex, ethnic group, and education level (Supplementary Table 2).

CONCLUSIONS—In this national area probability sample of community-dwelling Americans aged 57–85 years, depression and the perceived burden of disease differed by age and diabetes status. Respondents with diabetes had more comorbid conditions than those without diabetes across the age spectrum, but depression and self-rated health were significantly worse chiefly in respondents with diabetes aged 57–74 years compared with peers without diabetes; the oldest age cohort with diabetes did not rate themselves much differently from their peers without diabetes.

While nationally representative, the findings are limited by their cross-sectional nature, the lack of information on duration of diabetes, and, possibly, diabetes self-report, though diabetes self-report is highly valid in older populations (12). In addition, respondents from different generations may differ in how they rate their symptoms of depression and their overall health. NSHAP did not distinguish between type 1 and type 2 diabetes. Most diabetes in the population age >57 years is type 2 diabetes, and the majority of people affected by type 2 diabetes are in the age-group sampled.

Despite these limitations, this report demonstrates that the experience and perception of diabetes differ by age. Several studies have identified an age-diabetes interaction (13,14). We expand this prior work by showing that while some among the old may have poorly controlled diabetes (3,15), the physical and psychological burden, in general, appears to be greater in middle-aged groups. These findings suggest a role for more aggressive medical and psychological care in middle-aged patients with diabetes, while prioritizing diabetes within the context of other problems among older patients.

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