Major depression in community-dwelling middle-aged and older adults: prevalence and 2- and 4-year follow-up symptoms

RAMIN MOJTABAI* AND MARK OLFSON

Department of Psychiatry, Columbia University, New York, USA

ABSTRACT

Background. Although major depression is a common condition across the age range, there is some evidence from clinical studies that it may be more persistent and disabling in older adults. This study examined the demographic, socio-economic and clinical factors associated with major depression and with persistence of depressive symptoms at 2- and 4-year follow-ups in a large population sample of middle-aged and older adults.

Method. In a sample of 9747 participants aged over 50 in the 1996 wave of the US Health and Retirement Study, the authors assessed the 12-month prevalence of major depression using the Composite International Diagnostic Interview – Short Form (CIDI-SF). Significant depressive symptoms at the time of 1996, 1998 and 2000 interviews were assessed using a short form of the Center for Epidemiological Studies Depression Scale (CES-D).

Results. The 12-month prevalence of CIDI-SF major depression was 6·6%. With age, prevalence declined, but the likelihood of significant depressive symptoms at follow-ups increased. Both prevalence and persistence of significant depressive symptoms at follow-ups were associated with socio-economic disadvantage and physical illness. Persistence of depressive symptoms at follow-ups was also associated with symptoms of anhedonia, feelings of worthlessness, and thoughts of death at baseline.

Conclusions. Sociodemographic, physical health and a specific profile of depressive symptoms are associated with a poorer course of major depression in the middle-aged and older adults. These indicators may identify a subgroup of patients in need of more careful follow-up and intensive treatment.

INTRODUCTION

Major depression is an important public health problem in later life (Lebowitz *et al.* 1997). In older adults, major depression may lead to significant impairment in role functioning (Penninx *et al.* 1999; Abrams *et al.* 2002), increased mortality due to physical illness (Whooley *et al.* 1998; Schulz *et al.* 2000; Abramson *et al.* 2001; Penninx *et al.* 2001), and increased risk of suicide, particularly in men (Conwell *et al.* 1996;

Wærn *et al.* 2002). While there are numerous studies of major depression in samples of older primary care patients (Blazer & Williams, 1980; Robins & Regier, 1991; Schulberg *et al.* 1998; Lyness *et al.* 1999, 2002; Copeland *et al.* 1999), scant recent information is available concerning the rate and patterns of major depression, diagnosed according to formal criteria, in large representative samples of community-dwelling middle-aged and older adults. Most studies were based on small samples, used rating scales to define depression, and focused on the 65+ or 70+ year age range (Beekman *et al.* 1999). Furthermore, most studies were from European

* Address for correspondence: Ramin Mojtabai, 2600 Netherland Ave, Apt. no. 805, Bronx, NY 10463, USA.
 (Email: rm322@columbia.edu)

countries and few from the USA. Prevalence estimates vary considerably even across European countries (Copeland *et al.* 1999).

In the largest USA general population survey of mental disorders to date, the Epidemiologic Catchment Area (ECA) study of the 1980s, the 12-month prevalence estimates of major depression, ascertained by the Diagnostic Interview Schedule (DIS) was 2·3% in the 45–64 years age range and 0·9% in the 65+ age range (Robins & Regier, 1991). The lifetime prevalence estimates were 3·6% and 1·7% respectively. The estimates were considerably higher in a more recent community study of older adults (aged 65+) from a single county in Utah where point prevalence estimates of major depression assessed by the DIS was 4·4% in women and 2·7% in men, and lifetime prevalence was 20·4% and 9·6% respectively (Steffens *et al.* 2000).

The course of major depression in community dwelling middle-aged and older adults also remains poorly defined. Available evidence from primary care patient samples and the few community samples in the USA and Europe suggests that major depression is often persistent in older adults (Schulberg *et al.* 1998; Cole *et al.* 1999; Denihan *et al.* 2000; Beekman *et al.* 2002; Lyness *et al.* 2002). However, small sample sizes have limited efforts to describe individual characteristics associated with the course of major depression in this population (Cole *et al.* 1999).

In the present study, we examine the prevalence of depression and persistent depressive symptoms, assessed at three time-points, in a large and nationally representative community sample of middle-aged and older adults with major depression in the USA. We present 12-month prevalence estimates of major depression stratified by age, sex, race/ethnicity, education, income, and several common health conditions. We also examine the extent and predictors of persistent significant depressive symptoms (defined below) among participants with major depression.

METHOD

Sample

This report uses data from the third, fourth and fifth waves of the Health and Retirement Study (HRS) conducted in 1996, 1998 and 2000, respectively. HRS is a longitudinal survey of community-dwelling adults in the USA, sponsored by the National Institute of Aging and conducted by the Institute of Social Research at the University of Michigan (Juster & Suzman, 1995). The original HRS sample was drawn from screening 69 336 households selected through a multi-stage clustered area probability sampling design. In these households, individuals who were born between 1931 and 1941 were approached and invited to participate in the study; of these 78% agreed to participate and were recruited. The HRS cohort was initially interviewed in 1992, and has been followed and re-interviewed every two years since then. In addition to the selected individuals, who were 51–61 years old in 1992, their spouses or partners, irrespective of age, were included in the sample. HRS oversampled blacks, Hispanics and Florida residents. However, when adjusted by using sample weights, the HRS data are nationally representative. After the 1992 interview wave, the majority of interviews were conducted over the phone. In 1996, 92·8% of the interviews were conducted over the phone and the rest in person.

The sample for this report was drawn from those HRS participants who were interviewed in the third wave of the survey in 1996. Of the 12 576 HRS participants interviewed in 1992, 10 583 (84·2%) were interviewed in 1996. Another 493 (3·9%) had since died. Compared to surviving participants who refused to be interviewed or were lost in 1996, those who were interviewed were significantly younger, more likely to be male, and less likely to be from minority racial/ethnic groups. We further limited the sample for this report to participants who were 50 years old or older in 1996 and who had completed the structured interview for major depression (see below). Overall, 9747 individuals met these criteria and were included in the sample for this report. In 1998, 88·9% (*n* = 8669) of the 1996 sample and in 2000, 82·6% (*n* = 8053) of the 1996 sample were re-interviewed and rated on a scale for depressive symptoms (see below). Another 5·2% (*n* = 503) died between the 1996 and the 2000 interviews.

Assessment

Major depression was assessed by the short form of the Composite International Diagnostic Interview (CIDI-SF) (Kessler *et al.* 1998) based

on the criteria for major depression in DSM-III-R (APA, 1987). CIDI-SF was administered at the third wave of HRS in 1996. The reliability and criterion validity of CIDI-SF have been established in previous studies (Kessler *et al.* 1998; Turvey *et al.* 1999; Steffick, 2000). The diagnosis of 12-month major depression on the CIDI-SF required five or more depressive symptoms out of the eight experienced in the same two-week period over the last 12 months.

Rating of persistent significant depressive symptoms was based on the short form of the Center for Epidemiological Studies Depression scale (CES-D) (Radloff, 1977) administered in interviews at 1996, 1998 and 2000. This instrument assessed symptoms experienced over the past week. Previous studies have shown that the 20-item CES-D can be shortened with little loss of precision or information (Kohout *et al.* 1993). Based on these studies, an eight-item CES-D short form was specifically adapted for use in face-to-face and phone interviews in the HRS (Turvey *et al.* 1999; Gallo *et al.* 2000; Steffick, 2000). A score of 4 on the eight-item short CES-D scale corresponds to a score of 16 on the full version of the CES-D, which indicates significant depressive symptoms (Steffick, 2000). Participants with significant depressive symptoms at all assessment points were defined as having persistent significant depressive symptoms. For participants with missing data on one or two assessment points, rating was based on available data points. We note that when the analyses were repeated after limiting the sample to participants with full data (all three assessments) the results were remarkably similar.

Psychiatric treatment was assessed by two questions: 'Do you now get psychiatric or psychological treatment for your problems?' and 'Do you now take tranquilizers, antidepressants, or pills for nerves?' Psychiatric treatment was operationalized as a positive response to either or both of these questions. These questions were asked from all participants who either in previous waves of interviews or in the index interview responded positively to the question: 'Have you ever had or has a doctor ever told you that you have any emotional, nervous, or psychiatric problems?'

Physical conditions were assessed by asking the participants if they ever had, or if a doctor had ever told them that they had arthritis, high blood pressure, diabetes, heart disease, lung disease (except asthma), stroke or cancer. Each condition was ascertained by a separate question. Participants were also asked if they had had a heart attack or a stroke over the past 2 years. The responses were rated as dichotomous variables (yes = 1, no = 0).

Household income was assessed by asking about income from all sources in the past year. If the participant could not give an exact amount, he/she was asked to give an approximate amount or indicate whether the amount was more or less than a certain US dollar amount. The approximate amount could be imputed using parallel questions with various dollar amounts.

Financial assets were assessed by an imputation method similar to the one used for household income.

Analysis

Analyses were conducted in three stages. First, the 12-month prevalence and variables associated with major depression in this population were assessed. The full sample of respondents 50 years old or older was used for these analyses.

Second, prevalence and predictors of persistent significant depressive symptoms were examined using contingency table analysis and multivariate logistic regression, controlling for severity of the 1996 depressive episode as rated by the number of CIDI-SF symptoms and for receiving any psychiatric treatment in 1996. These analyses were limited to participants who met the CIDI-SF criteria for 12-month major depression in 1996.

Finally, we examined whether a certain symptom profile is associated with persistence of significant depressive symptoms. For this, we compared the prevalence of CIDI-SF symptoms ascertained in 1996 between cases with persistent significant depressive symptoms and the other cases of major depression using contingency table analysis.

To assess the impact of age more carefully, analyses in steps one and two were repeated in the two age groups of 50–64 and 65+ years, separately. Because the results of these analyses were generally consistent with the analyses for the total 50+ age group, only the results for the total group are presented. Analyses for

Table 1. *Prevalence of 12-month major depression according to sociodemographic characteristics and physical conditions in adult participants in the 1996 Health and Retirement Study*

Characteristic	Unweighted, n	Percentage (95% CI) with major depression	Contingency table analysis results[a]
Total	9747	6·6 (6·1–7·1)	—
Age (years)			
50–54	931	9·2 (7·1–11·9)	
55–59	3813	7·7 (6·7–8·8)	
60–64	3465	5·6 (4·9–6·4)	
65+	1538	4·0 (2·9–5·4)	$F = 8·86$***
Sex			
Female	5427	8·5 (7·8–9·3)	
Male	4320	4·1 (3·5–4·7)	$F = 64·81$***
Race/ethnicity			
White	7207	6·3 (5·8–6·9)	
Black	1511	7·3 (6·1–8·8)	
Hispanic	822	8·0 (6·0–10·8)	
Other	180	9·1 (5·0–15·8)	$F = 1·60$
Marital status			
Never married	278	6·1 (3·9–9·6)	
Married or living as married	7521	5·5 (4·9–6·0)	
Separated/divorced/living apart	1175	11·3 (9·5–13·4)	
Widowed	773	10·8 (8·5–13·6)	$F = 22·39$***
Education			
<High school	2635	9·4 (8·0–11·0)	
High school	3447	6·5 (5·7–7·4)	
>High school	3643	5·0 (4·4–5·7)	$F = 19·40$***
Current employment status			
Unemployed	4312	9·2 (8·2–10·3)	
Employed	5407	4·6 (4·1–5·2)	$F = 65·43$***
Household annual income (US$)			
<15 000	1925	12·5 (10·8–14·5)	
15 000–29 999	2042	7·0 (5·9–8·4)	
30 000–49 999	2170	6·0 (4·9–7·4)	
50 000–74 999	1695	4·2 (3·2–5·5)	
75 000+	1863	3·8 (2·9–5·0)	$F = 24·63$***
Assets (US$)			
<5000	2087	12·5 (10·5–14·9)	
5000–24 999	1635	7·4 (6·2–8·7)	
25 000–99 999	2268	5·9 (4·8–7·2)	
100 000–249 999	1706	4·4 (3·6–5·4)	
250 000+	1999	3·8 (3·0–4·9)	$F = 26·13$***
Physical illness			
Arthritis	5138	8·9 (8·2–9·7)	$F = 108·51$***
Hypertension	4528	8·3 (7·3–9·4)	$F = 24·00$***
Diabetes	1280	10·3 (8·7–12·1)	$F = 24·88$***
Heart disease (any)	1784	12·2 (10·7–13·7)	$F = 112·65$***
Heart attack in the past 2 years	185	19·2 (13·3–26·9)	$F = 35·23$***
Lung disease (except asthma)	1060	14·8 (12·1–18·0)	$F = 63·71$***
Stroke (any)	434	14·3 (10·3–19·4)	$F = 24·12$***
Stroke in the past 2 years	24	26·1 (9·9–52·9)	$F = 9·60$**
Cancer	781	9·5 (7·7–11·6)	$F = 13·20$***
None of the above conditions	2096	2·7 (2·1–3·5)	$F = 60·72$***

[a] Design-based F test.
* $p < 0·05$; ** $p < 0·01$; *** $p < 0·001$.

step three were repeated by controlling for age in logistic regression models with persistent significant depressive symptoms as the outcome of interest and individual symptoms as predictors.

Analytic approach

We followed a design-based approach for the analyses reported here, in which frequency weights, strata and primary sampling units were
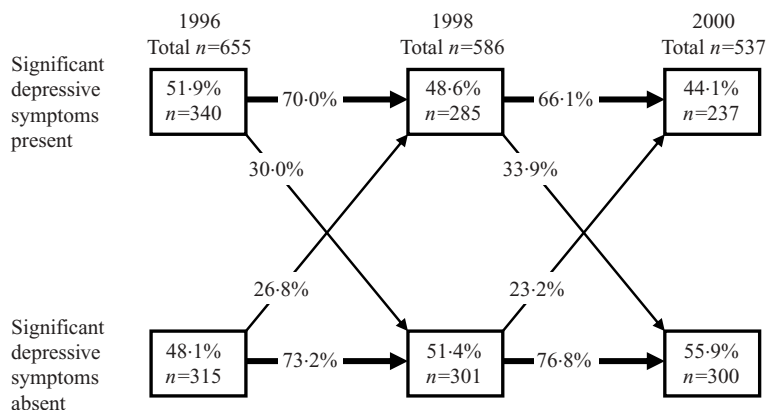
FIG. 1. Participants with 12-month major depression and significant depressive symptoms (CES-D ⩾4) at 1996, 1998 and 2000 assessment points (percentages are based on unweighted data).

used to adjust the parameter estimates and their variances. Taylor series linearization method (Lee *et al*. 1989) as implemented in the svytab and svylogit routines of STATA 7 (StataCorp, 2001) was used for these computations.

RESULTS

Prevalence of major depression and association with sociodemographic characteristics

The 12-month prevalence of major depression in this sample of 9747 older adults was 6·6% (*n*=661). Major depression was more common in the younger than older participants, following a consistent age gradient (Table 1). Depression was also more common among women than men, and among those who were separated, divorced, living apart or widowed than among the married or never-married, and among those with less education compared to those with more education. Retired participants, those with lower income and fewer financial assets were also more likely to experience major depression. Finally, physical conditions, particularly recent stroke and heart attack were strongly associated with major depression (Table 1).

Prevalence and predictors of persistent significant depressive symptoms

Approximately one-half of the participants with major depression had significant depressive symptoms (CES-D score ⩾4) at each of the assessment points (Fig. 1). Approximately one-third (30·4%, *n*=192) had persistent significant

depressive symptoms (CES-D ⩾4 at all assessment points). Having significant depressive symptoms at one assessment point was predictive of significant depressive symptoms at future assessment points (Fig. 1).

In the contingency table analyses, age, racial group, marital status, education, current employment, income, assets, various physical conditions, severity of major depressive episode and 1996 psychiatric treatment were all associated with persistent significant depressive symptoms (Table 2). Of the 661 participants with major depression, 29·6% (*n*=195) stated that they took 'tranquilizers, antidepressants, or pills for nerves,' and an additional 2·3% (*n*=16) stated that they received 'psychiatric or psychological treatment,' but did not report taking medications. Overall, 32·0% (*n*=211) of participants with major depression were receiving any psychiatric treatment. No questions were asked about counseling or psychotherapy or the specific medications. After controlling for psychiatric treatment and severity of depressive episode (measured by the number of 12-month CIDI-SF symptoms) in multivariate logistic regression analyses, the associations with hypertension, diabetes and lung disease were no longer statistically significant.

To examine whether the effect of income and assets could be attributed to current employment status we conducted further analyses in which we entered employment into the multivariate models of Table 2 for income and for assets. The results indicated that even after

Table 2. *Correlates of persistent significant depressive symptoms (CES-D $\geqslant 4$ at 1996, 1998 and 2000) among 661 participants with major depression in 1996*

Characteristic	Unweighted, n	Percentage (95% CI) with persistent significant depressive symptoms	Contingency table analysis results[a]	Multivariate logistic regression AOR (95% CI)[b]
Age (years)				
50–54	82	14·9 (8·7–24·5)		Ref.
55–59	314	28·6 (22·4–35·9)		2·69 (1·45–4·98)**
60–64	201	27·3 (20·2–35·6)		2·73 (1·36–5·50)**
65+	64	37·8 (26·1–51·2)	$F = 3·15*$	4·66 (1·93–11·23)**
Sex				
Female	470	26·8 (22·4–31·7)		Ref.
Male	191	27·7 (19·9–37·2)	$F = 0·40$	1·02 (0·62–1·68)
Race/ethnicity				
White	466	22·9 (18·3–28·2)		Ref.
Black	108	45·9 (34·7–57·5)		3·23 (1·90–5·71)***
Hispanic	63	40·9 (30·7–51·9)		2·14 (0·98–3·70)**
Other	23	41·9 (24·3–61·7)	$F = 9·91***$	2·60 (1·17–5·79)*
Marital status				
Never married	19	19·4 (6·2–46·8)		0·63 (0·20–2·03)
Married or living as married	426	22·0 (17·2–27·7)		Ref.
Separated/divorced/living apart	127	35·7 (27·8–44·4)		1·91 (1·16–3·15)*
Widowed	89	40·9 (28·8–54·3)	$F = 5·28**$	2·21 (1·11–4·39)*
Education				
<High school	303	36·1 (29·7–42·9)		Ref.
High school	193	27·7 (20·4–36·5)		0·75 (0·46–1·23)
>High school	164	13·9 (8·9–21·1)	$F = 10·19***$	0·29 (0·12–0·51)***
Current employment status				
Unemployed	419	33·8 (28·0–40·2)		Ref.
Employed	242	16·9 (12·3–22·8)	$F = 19·83***$	0·45 (0·29–0·70)**
Household annual income (US$)				
<15 000	236	38·8 (30·8–47·5)		Ref.
15 000–29 999	147	31·8 (23·7–41·2)		0·88 (0·52–1·50)
30 000–49 999	126	21·3 (14·3–30·6)		0·45 (0·27–0·77)**
50 000–74 999	73	15·2 (7·7–27·7)		0·31 (0·14–0·69)**
75 000+	72	10·6 (5·0–21·2)	$F = 6·67***$	0·23 (0·09–0·59)**
Assets (US$)				
<5000	249	40·3 (32·2–48·9)		Ref.
5000–24 999	106	31·2 (20·5–44·4)		0·86 (0·45–1·67)
25 000–99 999	132	22·0 (15·8–29·7)		0·49 (0·27–0·89)*
100 000–249 999	89	7·4 (3·2–16·2)		0·15 (0·06–0·32)***
250 000+	78	17·2 (9·0–30·1)	$F = 7·57***$	0·42 (0·19–0·92)*
Physical illness				
Arthritis	481	31·6 (26·5–37·1)	$F = 11·06**$	2·29 (1·34–3·92)**
Hypertension	379	31·7 (26·2–37·7)	$F = 5·98*$	1·49 (0·90–2·46)
Diabetes	146	37·1 (27·0–48·6)	$F = 5·43*$	1·54 (0·88–2·70)
Heart disease (any)	223	34·0 (26·6–42·2)	$F = 7·09***$	1·55 (1·05–2·31)*
Lung disease (except asthma)	155	34·9 (27·4–43·2)	$F = 5·84*$	1·46 (0·94–2·29)
Stroke (any)	59	38·1 (25·9–51·9)	$F = 3·97$	1·46 (0·81–2·60)
Cancer	81	26·6 (16·7–39·5)	$F = 0·01$	0·83 (0·43–1·62)
None of the above conditions	56	13·2 (6·1–26·5)	$F = 4·59*$	0·38 (0·14–1·04)
Severity of depressive episode (number of CIDI-SF symptoms)				
5	160	17·5 (11·6–25·5)		—
6	180	22·5 (16·6–29·8)		—
7	180	28·0 (20·9–36·5)		—
8	141	45·5 (35·7–55·7)	$F = 8·89***$	—
Any psychiatric treatment in 1996				
Received	211	40·4 (32·4–48·9)		—
Not received	450	20·8 (16·2–26·2)	$F = 16·01***$	—

[a] Design-based F test.
[b] AOR, adjusted odds ratio obtained in logistic regressions adjusting for severity of depressive episode and treatment status.
* $p < 0·05$; ** $p < 0·01$; *** $p < 0·001$.
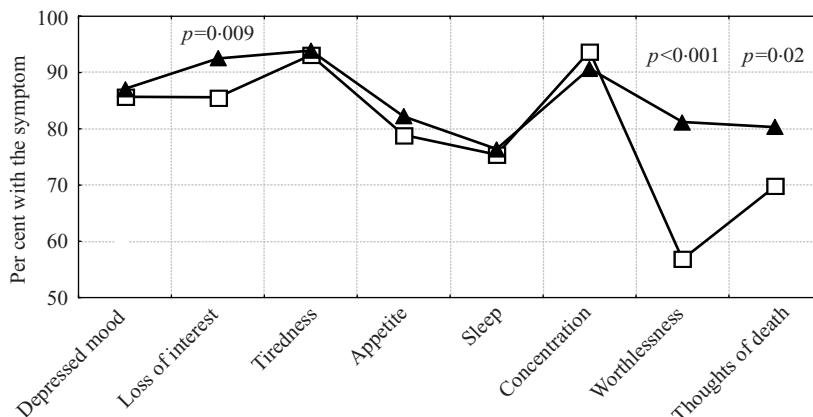
Depressed mood 'During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row?'
Loss of interest 'During those two weeks, did you lose interest in most things?'
Tiredness 'Thinking about those same two weeks, did you ever feel more tired out or low in energy than is usual for you?'
Appetite 'During those same two weeks, did you lose your appetite?' 'Did your appetite increase during those same two weeks?'
Sleep 'Did you have more trouble falling asleep than you usually do during those two weeks?'
Concentration 'During that same two-week period did you have a lot more trouble concentrating than usual?'
Worthlessness 'people sometimes feel down on themselves, and no good or worthless. During that two week period, did you feel this way?'
Thoughts of death 'Did you think a lot about death – either your own, someone else's, or death in general – during those two weeks?'

Fig. 2. Symptom profiles of 661 participants with 12-month major depression in 1996 with (▲) and without (□) persistent significant depressive symptoms (CES-D ≥ 4 at 1996, 1998 and 2000 assessment points).

controlling for 1996 current employment status, the relationship between depressive symptoms and income ($F = 3.35$, $p = 0.02$) on the one hand, and assets ($F = 10.72$, $p < 0.001$), on the other, persisted.

Symptom profiles of participants with persistent significant depressive symptoms

Participants with 12-month major depression in 1996 who presented with persistent significant depressive symptoms were remarkably similar to the rest of the participants with major depression on five of the eight CIDI-SF symptoms (Fig. 2). However, they had significantly higher rates of three symptoms: loss of interest, feelings of worthlessness, and thoughts of death. After controlling for age in multiple logistic regressions, loss of interest [adjusted odds ratio (AOR) = 2.72, 95% confidence interval (CI) = 1.39–5.33, $p = 0.004$], worthlessness (AOR 3.20, 95% CI 2.06–4.96, $p < 0.001$) and death

ideations (AOR 1.77, 95% CI 1.11–2.81, $p = 0.02$) were all significantly associated with persistent significant depressive symptoms.

DISCUSSION

Major depression is common among middle-aged and older adults in the USA. These data indicate that an estimated one in fifteen (6.6%) adults 50 years old or older experiences major depression in the course of one year. While the prevalence of major depression declines with age, it is still common in the older population. One in 25 (4.0%) adults 65 years old or older experience major depression in the course of a year. These estimates are substantially higher than the ECA estimates of 2.3% and 0.9% in the 45–64 and 65+ age groups (Robins & Regier, 1991). Differences in diagnostic instruments, as well as the populations sampled may partly explain these differences in estimates.

The impact of instruments on prevalence rates was highlighted by a study that compared prevalence rates in the ECA, which used DIS for case ascertainment, and the National Comorbidity Survey (NCS), which used CIDI (Regier *et al*. 1998). The prevalence rates in the NCS were considerably higher than ECA, suggesting that the CIDI diagnoses might be overinclusive or, alternatively, DIS diagnoses may be too restrictive. There is some evidence that CIDI-SF may be even more permissive than CIDI. A comparative study of CIDI-SF against CIDI found that 25% of participants who met criteria for major depression on CIDI-SF did not meet such criteria on CIDI (Patten *et al*. 2000). On the other hand, a recent study found that DIS misses over 70% of the cases of major depression identified by a semi-structured interview administered by psychiatrists (Eaton *et al*. 2000), thus grossly underestimating the prevalence of major depression. In the absence of a gold standard for diagnosis of major depression it is not possible to compute an exact prevalence rate for this condition. The best approach might be to qualify any reported estimates by the method of ascertainment and to compare rates from studies that used the same ascertainment method. Thus, the 12-month CIDI-SF rates of major depression in this study should be compared with rates based on 12-month CIDI-SF from other studies.

Two other studies reported 12-month CIDI-SF prevalence rates of major depression in population samples of middle-aged and older adults (Lindeman *et al*. 2000; Patten, 2000). Patten (2000), from Canada, reported the prevalence rates separately for women and men. The prevalence in the 45–64 age group was 6·3% in women and 3·5% in men and, in the 65+ age group, 3·1% in women but, owing to the small sample size, could not be estimated in men. In comparison, the prevalence estimates in the 50–64 age group in the present study was 8·6% in women and 4·7% in men. In the 65+ women, the prevalence was 7·4%. The second study from Finland reported 12-month CIDI-SF prevalence rates of 11·8%, 7·6% and 6·7% in the 45–54, 55–64 and 65–75 age groups, respectively (Lindeman *et al*. 2000). In comparison, in the present study, prevalence rates were 9·2%, 6·7% and 4·1% in the 50–54, 55–64 and 65–75 age groups. Thus, the prevalence estimates from

this study appear to be higher than Canada but lower than Finland.

Similar differences in the rates of mental disorders and use of psychiatric services have been noted between younger general population samples from the USA and Canada (Kessler *et al*. 1997). Studies within the USA (Robins & Regier, 1991) and Europe (Copeland *et al*. 1999) have also noted considerable variations across regions in prevalence of depressive disorders. Socio-economic and physical health factors that appear to be associated with the distribution of depression within different settings may also be associated with variations across settings (Lorant *et al*. 2003).

The prevalence of major depression appears to decline with advancing age. As compared to adults in their early fifties, those who are 65 years old or older have less than one-half the risk of experiencing major depression. A similar age-related decline in prevalence of major depression has been observed in a number of other studies (Romanoski *et al*. 1992; Palsson & Skoog, 1997; Jorm, 2000; Korten & Henderson, 2000). The reasons for this decline remain poorly understood but may include depression-related mortality, increased prevalence of somatic symptoms that are not currently recognized as symptoms of major depression or decreased emotional responsiveness (Blazer, 1989; Palsson & Skoog, 1997; Jorm, 2000). In view of the personal losses, physical illnesses, and functional disabilities that commonly befall older age groups, it is surprising that major depression tends to decline rather than increase with advancing age. Attribution of depressive symptoms to physical conditions cannot fully explain the reduction in rates since, unlike some other structured diagnostic interview instruments, notably the DIS (Knäuper & Wittchen, 1994), CIDI-SF does not exclude symptoms that the participants might attribute to physical illness.

Persistent depressive symptoms are common at follow-up points among older adults with major depression. This observation extends earlier findings in younger adults (Mojtabai, 2001) and confirms the chronic nature of depression across the age spectrum. There is also an increase in follow-up symptoms with age. While only 14·9% of the participants with major depression who were in their early fifties had

significant symptoms at follow-up, 37·8 % in the 65 + age group had such symptoms.

Despite these variations with age, in many respects, the distribution of major depression in older adults resembles the pattern observed in younger adults (Blazer *et al.* 1994). In both age groups, there is a predominance of females, persons with less formal education, the unemployed, individuals who are separated, widowed, or divorced, and individuals with lower incomes. The mechanisms that account for these associations remain poorly understood.

A female predominance of depression is one of the most consistent findings in depression (Weissman & Olfson, 1995). It remains unclear whether biological factors, such as endocrinologic and genetic influences, or widespread social factors, such as differences in gender roles, account for the gender disparity. Because the female predominance persists into middle and early old age, it is unlikely to be related to gender role differences (e.g. child-bearing, rearing of young children, career decisions) common to younger adults or to female sex hormones. Although there is some evidence that the gender disparity decreases with advancing age, the decline in female/male ratio becomes evident only in the mid to late sixties (Jorm, 1987; Forsell *et al.* 1995; Copeland *et al.* 1999).

Both prevalence of major depression and persistence of symptoms in this study appeared to be related to socio-economic adversity. This finding is consistent with other studies examining the association of socio-economic inequalities and depression across the age range (Lorant *et al.* 2003). The basis for this relationship is a matter a longstanding controversy (Bruce *et al.* 1991; Weich & Lewis, 1998; Ostler *et al.* 2001; Ritsher *et al.* 2001). Some social scientists hypothesize that environmental factors contribute to the risk of major depression. In the elderly, there is evidence that bereavement (Turvey *et al.* 1999) and involuntary job loss (Gallo *et al.* 2000) increase the rate of depression. Other researchers posit that depression prevents attainment of expected social position by interfering with role functioning. Clarifying the role of socio-economic disadvantage in the pathogenesis of depression requires long-term follow-up studies that permit temporal tracking of changes in socio-economic status and depressive symptoms.

One factor that might explain the relationship of socio-economic status and persistence of depressive symptoms is treatment. Approximately one-third of the participants with major depression reported being in psychiatric treatment at the time of the 1996 assessment. Previous studies indicate that minority status and poverty present important barriers to psychiatric treatment (U.S. Department of Health and Human Services, 1999). But, treatment *per se* could not explain the observed relationship since the variable of psychiatric treatment was included in the multivariate models. Rather, it appears that the quality of treatment varies across the socio-economic spectrum in the USA, with disadvantaged patients often receiving treatments of less intensity and lower quality (Young *et al.* 2001).

Physical conditions, especially arthritis and cardiac disease, were strongly associated with the prevalence of major depression and persistent significant depressive symptoms in middle-aged or older adults. This observation is in line with a number of other reports reviewed by Palsson & Skoog (1997) and extends findings from a study of a small sample of older primary care patients which indicated that physical conditions commonly interfere with recovery from depression (Kivela *et al.* 2000). The association of physical conditions with depression may be mediated by biological processes or the associated disability and impairment in role functioning which often accompany these conditions. Because depression is a risk factor for subsequent cardiac mortality in adults with cardiac disease (Penninx *et al.* 2001), aggressive case-finding and treatment strategies are indicated for the large number of older adults with cardiac illness and persistent depression.

Historically, certain symptom patterns have been associated with more severe depressive illness in clinical samples (Winokur, 1985). The DSM-IV (APA, 1994) also identified a more severe 'melancholic' form of depression characterized by loss of interest, lack of reactivity to pleasurable stimuli, diurnal variation of mood and change of eating and sleep patterns. The association of specific symptoms with course and outcome, however, remains unclear.

A report based on the 1-year follow-up of the ECA sample found that only 'suicidal features'

were positively associated with the risk of persistent depression (Sargeant *et al.* 1990). A 13-year follow-up of the older participants in the Baltimore ECA sample found that among participants with minor depression (fewer depressive symptoms than required for a DSM-III diagnosis of major depression), subjects without depressed mood had poorer outcome than those with depressed mood (Gallo *et al.* 1997). This study, however, did not examine the predictive value of symptoms in cases with major depression. We did not find any association between depressed mood and follow-up symptoms in individuals with major depression. Moreover, the profiles of subjects with and without persistent significant depressive symptoms were similar for most symptoms, with the notable exceptions of symptoms of loss of interest, feelings of worthlessness and thoughts of death, that were much more common among subjects with persistent significant depressive symptoms. These symptoms might be used as prognostic indicators in this age group, identifying a subgroup of patients in need of closer follow-up and intensive treatment.

The findings from this study are constrained by several limitations of population survey data in general (Snowdon, 2001) and HRS in particular. First, the sample was recruited from the community-dwelling older adult population. Depression is likely more common in institutionalized populations. Therefore, our prevalence rates are likely underestimates of the true prevalence of major depression in the elderly. Second, detailed information was not available concerning the treatment of depression. For this reason, it is not possible to determine the extent to which depressive symptoms at follow-up were attributable to differential access to effective treatments. The inverse relationship between treatment and severity of psychopathology in this study is also commonly observed in other naturalistic studies, and represents the effect of selection into treatment due to severity of illness (Gilbody *et al.* 2002). Third, ascertainment of physical conditions are purely based on self-report information and so may be less accurate than diagnoses based on medical record review. However, self-reports on physical conditions in this age range tend to be, for the most part, reliable and valid (Halabi *et al.* 1992; Sherbourne & Meredith, 1992; Beekman *et al.*

1997). Fourth, CES-D measures symptoms during the past week and therefore does not permit separation of respondents with continued depressive symptoms from those with recurrent or episodic depressive symptoms. When we compared participants with significant CES-D scores (≥ 4) at one or two (but not all) follow-up points with those who had no significant symptoms at any follow-up points, we found a somewhat similar pattern to that presented in Table 2. Participants from minority racial/ethnic groups, those with lower incomes and financial assets, those who were unemployed at the time of interview, and participants with physical conditions were more likely to have significant episodic depressive symptoms than no significant symptoms. Fifth, imperfections in survey enrollment and follow-up raise the possibilities of selection and attrition biases. However, presence of significant depressive symptoms at each assessment point was not predictive of dropout in future assessment points. Sixth, a paucity of respondents greater than 70 years of age prevents us from describing the course of depression in this age group. Finally, prevalence of an illness is a result of both its incidence and duration. Therefore, we could not separate factors associated with incidence of major depression from those associated with its persistence in our prevalence analysis. Furthermore, we could not assess incidence of new cases of major depression in this cohort as the CIDI-SF was only administered once in 1996.

In summary, our data indicate that the burden of depression falls especially hard upon older adults who are poor, member of racial/ethnic minority groups, unemployed, physically ill, or have little formal education. Despite recent advances in the management of depression and a marked expansion in its treatment in the USA (Olfson *et al.* 2002), large numbers of socioeconomically disadvantaged older Americans continue to suffer from major depression. These findings bring a renewed urgency to public and private health promotion initiatives aimed at improving the community treatment of depression in older adults. The distribution of major depression and its persistence strongly suggests that such initiatives should give priority to economically deprived populations.

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