ORIGINAL ARTICLE

Psychosocial Disability Before, During, and After a Major Depressive Episode

A 3-Wave Population-Based Study of State, Scar, and Trait Effects

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Background: Psychosocial disability after remission from a unipolar major depressive episode (MDE) can be due to (1) residual symptoms (state effect), (2) the continuation of premorbid disability (trait effect), and/or (3) disability that developed during the MDE and persisted beyond recovery (scar effect).

Methods: Data came from the Netherlands Mental Health Survey and Incidence Study (NEMESIS), a prospective Dutch psychiatric population-based survey. We obtained psychiatric data (Composite International Diagnostic Interview) and information on psychosocial functioning (work, housekeeping, spouse/partner, and leisure-time domains) from 4796 respondents in 1996 (T1), 1997 (T2), and 1999 (T3). We evaluated trait effects using between-subject comparisons, and state and scar effects using within-subject comparisons.

Results: In 216 and 118 respondents, a first and a recurrent MDE developed, respectively, after T1 that remitted before T3. Compared with never-MDE individuals, first-MDE subjects had higher disability scores long before their episode (effect size, 0.42-0.57 U). During the MDE, disability further increased in first- and recurrent-MDE subjects (effect size, 0.44-0.79 U), but returned to its premorbid level after MDE remission, except in subjects who experienced a severe recurrent episode. If the premorbid period (T1 to MDE onset) was longer than the postmorbid period (MDE remission to T3), disability at T3 was higher than at T1, misleadingly suggesting scar effects. The reverse occurred if the premorbid period was shorter than the postmorbid period.

Conclusions: Postmorbid psychosocial disability reflects largely the continuation of premorbid psychosocial disability. Scarring does not occur routinely, but may occur in a severe recurrent episode. Within-subject premorbid-postmorbid comparisons are sensitive to state effects of prodromal and residual symptoms. These findings point at the following 2 independent processes: (1) the ongoing expression of trait vulnerability to depression in mild psychosocial dysfunctioning; and (2) synchrony of change between severity of depressive symptoms and psychosocial disability.

Arch Gen Psychiatry. 2004;61:387-392

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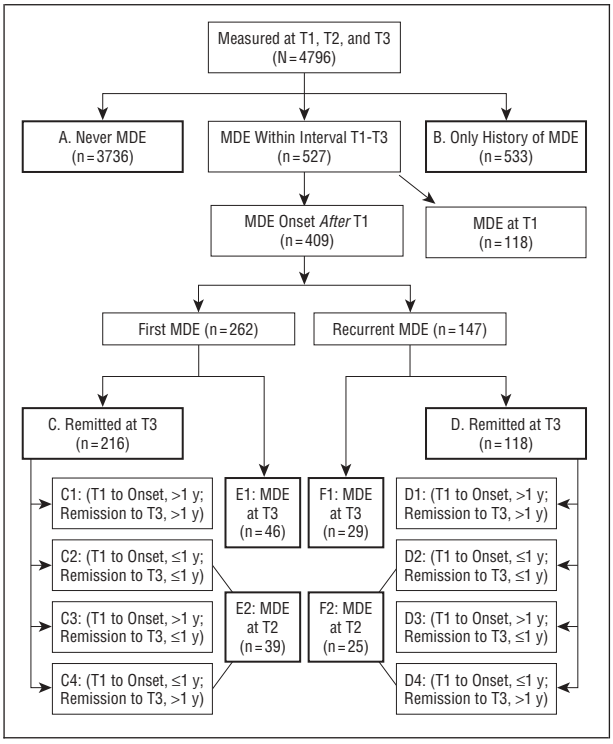
DEPRESSION IS AMONG THE top 5 leading causes of disability-adjusted life-years and premature death worldwide.[1] Unipolar major depressive episodes (MDEs) are associated with significant psychosocial disability, similar to or exceeding that noted in common medical illnesses.[2-9] The level of psychosocial disability varies as a function of depressive symptom severity,[10-14] and effective treatment of depression improves depressive symptoms and disability outcomes.[15-18] However, it is unclear how much psychosocial disability during an MDE was already present before the MDE, how much remains after the MDE, and why.

Most studies comparing psychosocial functioning in people with remission from an MDE with healthy control subjects found mild postmorbid disability.[4,14,19-21] In theory, postmorbid disability could have the following 3 origins: (1) the continuation of premorbid disability (trait effect); (2) disability due to postmorbid residual depressive symptoms (residual symptom state effect); and (3) disability that was not present before the MDE but developed during the episode and lasted beyond recovery of the episode (scar effect). Scarring could result from enduring changes, induced by the MDE, in appraisal and coping styles and in exposure to stress. Scarring may not occur routinely. Scarring might occur only in people who suffer a severe or long-lasting first episode, making the experience of psychosocial disability sufficiently severe and prolonged to solidify and endure; or only during a recurrent MDE because of the demoralizing effects of the recurrence of psychosocial disability.



Flowchart construction of the groups. MDE indicates major depressive episode; T1, 1996 study wave; T2, 1997 study wave; and T3, 1999 study wave.

To date, knowledge of postmorbid disability comes from cross-sectional and short-term treatment studies and a few long-term cohort studies of depressed patients. To decompose postmorbid disability into state, trait, and scar effects, a prospective multiwave population study is required, in which a large sample is followed up to identify first and recurrent episodes, with assessments of psychosocial disability before, during, and after the episode. It is essential to have premorbid disability data of first-MDE subjects, since the disability in depression-free people with a history of depression confounds trait and earlier scar effects. In addition, the timing of the premorbid and postmorbid disability assessments is important. If the premorbid assessment takes place long before MDE onset but the postmorbid assessment takes place shortly after MDE remission, the within-subject before-after MDE comparison may be biased by residual symptoms, wrongly suggesting scarring. Likewise, if the postmorbid assessment occurs long after MDE remission but the premorbid assessment shortly before MDE onset, the before-after comparison may be biased by prodromal symptoms, wrongly suggesting improved functioning, ie, the opposite of scarring.

To our knowledge, the 3-wave Netherlands Mental Health Survey and Incidence Study (NEMESIS) in the Dutch general population[6,22-25] is the first study that separated trait, scar, and residual-symptom state effects and evaluated the consequences of different premorbid and postmorbid periods on the before-after MDE comparison. As indicators of psychosocial disability, NEMESIS assessed functioning in the following 4 major domains of functioning: spouse/partner, work/employment, housekeeping, and leisure time activities. Dysfunction was defined as 1 or more deficiencies in the ability to perform activities and behaviors compared with what is considered normal for that domain by significant others.[3,11,26,27]

METHODS

SAMPLE

The NEMESIS provided the data presented in this article. Design, sample, and instruments of NEMESIS have been extensively described elsewhere.[22-24] Briefly, NEMESIS is a prospective psychiatric epidemiological survey in the Dutch adult general population (aged 18-64 years) with waves in 1996 (T1), 1997 (T2), and 1999 (T3). It used a multistage, stratified, random-sampling procedure. From each household we selected randomly 1 respondent. Interviewers made up to 10 telephone calls or visits to an address at different times of the day and days of the week to make contact. To optimize response and offset any seasonal influences, the initial fieldwork extended from February to December 1996.

In the first wave, we collected data by interview from 7076 persons, a response rate of 69.7%. At T2, 1458 respondents (20.6%) dropped out, and a further 822 (14.6%) dropped out at T3. We obtained General Health Questionnaire 12 data from 44% of the T1 nonresponders.[22] The T1 nonresponders had slightly lower average General Health Questionnaire 12 scores (1.16 vs 1.22, suggesting better mental health), a lower average age (40.2 vs 41.2 years), and a higher proportion of women (54.4% vs 53.3%). Their psychiatric morbidity (estimated by a logistic regression model) did not differ from that of the responders.[22] Attrition at T2 and T3 was weakly associated with psychopathology at an earlier wave.[25] Agoraphobia (odds ratio [OR], 1.96; 95% confidence interval [CI], 1.31-2.85) and social phobia (OR, 1.37; 95% CI, 1.07-1.76) at T1 predicted attrition at T2, and major depression (OR, 1.37; 95% CI, 1.05-1.54), dysthymia (OR, 1.80; 95% CI, 1.34-2.18), and alcohol dependence (OR, 1.83; 95% CI, 1.18-2.67) at T2 predicted attrition at T3 (ORs were adjusted for demographic factors). The present report uses the 4796 respondents who participated in all 3 waves.

At T1, 1- and 12-month and lifetime prevalence rates of major depression for women were 3.4%, 7.5%, and 20.1%, respectively; for men, 1.9%, 4.1%, and 10.9%, respectively.[23]

DIAGNOSTIC INSTRUMENT AND ASSESSMENT OF MDEs

We diagnosed psychiatric disorders according to *DSM-III-R* with the Composite International Diagnostic Interview (CIDI), version 1.1.[28] The CIDI is a structured interview developed by the World Health Organization[29] that has acceptable interrater and test-retest reliability for most nonpsychotic diagnoses, including major depression.[30-32] At T2 and T3, the CIDI lifetime framework was adapted to the 1-year T1-T2 interval and the 2-year T2-T3 interval. We assigned *DSM-III-R* diagnoses without the imposition of hierarchical exclusion rules and without the application of the functional impairment criterion. Persons with bipolar disorders were not included in the MDE group.

The MDEs were qualified in terms of severity as mild, moderate, or severe according to the *DSM-III-R* criteria. Duration was assessed with the Life Chart Interview[33,34] and dichotomized at 6 months.

CONSTRUCTION OF GROUPS

We constructed several groups from the CIDI data obtained at T1, T2, and T3 for between- and within-group comparisons (**Figure**). The never-MDE group (A in the Figure) refers to re-

Table 1. Evaluating State Effects*

Psychosocial Disability Domain	First MDE (Groups E; n = 85)			Recurrent MDE (Groups F; n = 54)		
	Mean (SD) Disability Scores			Mean (SD) Disability Scores		
	Premorbid, T1	During MDE, T2 or T3	ES Difference (95% CI)	Premorbid, T1	During MDE, T2 or T3	ES Difference (95% CI)
Spouse/partner†	16.41 (4.72)	19.06 (6.31)	0.44 (0.13 to 0.73)‡	18.03 (5.30)	20.03 (6.63)	0.33 (0.07 to 0.59)§
Employment†	12.30 (3.12)	14.07 (3.53)	0.53 (0.01 to 1.06)§	12.31 (3.36)	14.00 (2.73)	0.55 (0.11 to 0.99)§
Housekeeping†	8.67 (2.80)	9.13 (2.95)	0.16 (–0.07 to 0.40)	9.27 (2.75)	9.51 (3.10)	0.08 (–0.24 to 0.40)
Leisure time	10.86 (3.70)	13.13 (3.87)	0.60 (0.38 to 0.82)‡	10.91 (3.80)	14.04 (4.07)	0.79 (0.48 to 1.11)‡
Total score	12.03 (3.06)	13.42 (3.38)	0.37 (0.23 to 0.64)‡	12.48 (2.94)	14.25 (3.22)	0.57 (0.28 to 0.87)‡

Abbreviations: CI, confidence interval; ES, effect size unit; MDE, major depressive episode; T1, 1996 study wave; T2, 1997 study wave; T3, 1999 study wave.
*Indicates psychosocial disability before and during the MDE for first- and recurrent-MDE subjects.
†Owing to missing values (ie, domain not applicable), the number of subjects is less than indicated.
‡$P<.01$.
§$P<.05$.

spondents who never had an MDE and in whom none developed within the T1-T3 interval. The MDE-history-only group (B in the Figure) refers to respondents who had at least 1 MDE before T1 and in whom no recurrence developed within the T1-T3 interval. Two other groups are the remitted first-MDE subjects (C in the Figure) (first episode after T1 and no MDE at T3 [n=216]) and the remitted recurrent-MDE subjects (D in the Figure) (recurrent episode after T3 and no MDE at T3 [n=118]). Furthermore, we identified first-MDE subjects who still met MDE criteria at T3 (E1 [n=46]) and remitted first-MDE subjects who met MDE criteria at T2 (E2 [n=39]). For recurrent-MDE subjects, the corresponding groups were F1 (n=29) and F2 (n=25). In addition, we took the time from T1 to MDE onset (the premorbid period) and from MDE remission to T3 (the postmorbid period) into account, using data from the CIDI and the Life Chart Interview.[33] We split the premorbid and the postmorbid period into 1 year or less vs more than 1 year. This yielded 4 first (C1-C4) and 4 recurrent MDE subgroups (D1-D4).

PSYCHOSOCIAL DISABILITY

The key dependent measures examined in this article are psychosocial functioning in the following 4 major domains of life (or social roles): spouse/partner, work/employment, housekeeping, and leisure time. At each wave, we administered 4 scales of the self-report version of the Groningen Social Disability Schedule, which has good reliability and validity properties in the Dutch population.[3,11,26,27,35] Each scale measures the extent to which respondents experience limitations in their functioning in the respective domain. An important aspect of the Groningen Social Disability Schedule is that many questions ask the respondent to indicate whether his or her functioning deviates from the norm as told by significant others. The scales included the 9-item Employment scale (Cronbach α, 0.61-0.64; eg, "My boss was not satisfied with my work" and "I have had difficulty keeping up with my work"); the 10-item Partner scale (Cronbach α, 0.82-0.84; eg "Recently, my behavior has irritated my partner" and "I have avoided my partner lately"); the 6-item Housekeeping scale (Cronbach α, 0.68-0.69; eg, "I can't get my housework done on time" and "Others have complained that I am not doing the housework properly"); and finally, the 6-item Leisure Time scale (Cronbach α, 0.77-0.80; eg, "I cannot relax in my spare time" and "I do not get along with the people I spend leisure time with"). A total disability score was constructed by adding the 4 scale scores and dividing by 4. Higher scores indicate more psychosocial disability.

STATISTICAL ANALYSIS

We tested between-subject and within-subject differences in disability using *t* tests. We also performed repeated-measures analysis of variance (ANOVA) to adjust for possible retest and time effects across T1, T2, and T3 as observed in the never-MDE group.

To facilitate interpretation and comparison of between- and within-subject differences, we express these differences as effect sizes (ESs). Effect size is defined as the mean difference in disability between the contrasted groups or times, divided by the standard deviation of disability in the 2 groups. An ES of less than 0.20 is generally considered negligible; from 0.20 to 0.40, small; from 0.41 to 0.70, moderate; and greater than 0.70, large.

RESULTS

Of the 4796 individuals who participated in all 3 waves, an MDE developed after T1 in 409, and of these, 334 (81.7%) had recovered at T3. Of the 216 remitted first-MDE subjects, MDEs were mild in 36%, moderate in 31%, and severe in 32%. Mean episode duration was 6.1 months (SD, 5.7 months). Of the 118 remitted recurrent-MDE subjects, MDEs were mild in 25%, moderate in 35%, and severe in 41%; they lasted on average 4.9 months (SD, 3.7 months). Of those with a first MDE, 64% were women, and the mean age was 40 years. For recurrent MDEs, these rates were 75% and 37 years, respectively.

STATE EFFECT

We evaluated state effects by comparing the premorbid T1 disability scores of first-MDE subjects who still met MDE criteria at T2 or T3 with their scores during the MDE (groups E1+E2). We did the same for recurrent MDE subjects (groups F1+F2). **Table 1** shows that disability was higher during the episode than before the episode in all 4 domains of functioning, for first and recurrent MDEs. All differences were statistically significant, except for housekeeping. State ES ranged from 0.33 to 0.79. Repeated-measures ANOVA showed that the state effects were not due to possible retest or time effects. The results suggest moderate state effects.

TRAIT EFFECT

We evaluated trait effects by contrasting the remitted first-MDE group with the never-MDE group with regard to T1 disability. **Table 2** presents the results. The premorbid T1 disability scores of the remitted first-MDE group had an ES of 0.42 to 0.57 U higher than the T1 scores of the never-MDE group. We repeated this comparison for only those individuals who had a premorbid period of more than 1 year after T1 to reduce possible prodromal symptom bias. The differences remained significant, although they dropped with an ES of about 0.10 U. These results suggest moderate trait effects.

SCAR EFFECT

We evaluated scar effects, for remitted first- and recurrent-MDE subjects separately, by comparing premorbid T1 disability scores with their postmorbid T3 disability scores. Scar effects imply higher postmorbid than premorbid disability scores. The postmorbid T3 total disability score of remitted first-MDE subjects did not differ from their premorbid T1 score (**Table 3**). Before-after differences were not found for the individual domains of functioning (data not presented). The same held for recurrent-MDE subjects. Adjusting for time and retest effects did not yield evidence of scarring either.

Table 2. Evaluating Trait Effects*

Psychosocial Disability Domain	Mean (SD) Disability Scores: Never-MDE Group, T1 (n = 3736)	Mean (SD) Disability Scores: Remitted First-MDE Group, T1 (Premorbid)	ES Difference (95% CI)
Spouse/partner†	15.18 (3.53)	17.50 (4.57)	0.57 (0.39-0.75)‡
Employment†	10.93 (2.37)	12.06 (2.71)	0.44 (0.26-0.62)‡
Housekeeping†	7.33 (2.26)	8.56 (2.63)	0.50 (0.34-0.66)‡
Leisure time	8.92 (2.54)	10.09 (3.09)	0.42 (0.27-0.56)‡
Total disability score	10.46 (2.20)	11.70 (2.70)	0.50 (0.35-0.65)‡

Abbreviations: See Table 1.
*Indicates psychosocial disability at T1 for first- and never-MDE subjects.
†Owing to missing values (ie, domain not applicable), the number of subjects is less than indicated.
‡$P<.001$.

Although these results suggest that scarring does not occur routinely, it might occur in subcategories of MDEs. Therefore, we performed the same before-after disability comparison for severe, long-lasting, and severe long-lasting MDEs. We found more disability after rather than before the episode in the subcategory of severe recurrent MDEs (n=45) (total disability score, 11.41 vs 12.38; $t=2.7$ [$P<.01$]; ES, 0.37 U [95% CI, 0.09-0.65]).

We next examined the effect of prodromal and residual symptoms on the premorbid-postmorbid difference in disability by comparing different premorbid and postmorbid periods (Table 3). Premorbid and postmorbid periods are equal in subgroups C1 and C2 (in C1, both >1 year; in C2, both ≤1 year), and we did not find a premorbid-postmorbid difference in disability. However, in subgroups C3 and C4, where the premorbid and postmorbid periods differ, significant differences in disability arise. In subgroup C3, where the premorbid period is longer than the postmorbid period, we found higher disability scores after than before the episode, probably because of fewer prodromal symptoms at T1 than residual symptoms at T3. The reverse occurred in subgroup C4, where the premorbid period is shorter than the postmorbid period. The 4 subgroups of subjects with recurrent MDE (D1-D4) yielded similar patterns (data not shown).

COMMENT

Although psychosocial functioning was mildly impaired more than 1 year before the MDE compared with the level of psychosocial functioning in the never-MDE group (trait effect), and, in addition, further deteriorated during the MDE (state effect), it returned to its premorbid level after remission of the MDE (no scar effect). Hence, we found evidence of trait and state effects, but not a scar effect. Although scarring in psychosocial functioning did not occur routinely, the finding of more disability after the MDE than before the MDE in the subcategory of severe recurrent episodes suggests, if replicated, that scarring might occur in severe recurrent depression. Our findings point at the following 2 independent processes: (1) the ongoing expression of trait vulnerability to depression in the form of mild impairments in psychosocial functioning; and (2) synchrony of change between severity of depressive symptoms and

Table 3. Evaluating Scar Effects and Different Premorbid and Postmorbid Periods*

Subgroups of Remitted First-MDE Group†	Mean (SD) Disability Scores: Premorbid, T1	Mean (SD) Disability Scores: Postmorbid, T3	ES Difference (95% CI)
Total group (n = 216)	11.70 (2.70)	11.55 (2.88)	−0.05 (−1.18 to 0.08)
C1 (T1 to onset, >1 y; remission to T3, >1 y) (n = 23)	11.93 (2.25)	12.30 (2.97)	0.14 (−0.30 to 0.57)
C2 (T1 to onset, ≤1 y; remission to T3, ≤1 y) (n = 17)	12.67 (3.37)	12.94 (3.37)	0.08 (−0.49 to 0.65)
C3 (T1 to onset, >1 y; remission to T3, ≤1 y) (n = 68)	11.22 (2.51)	11.91 (2.67)	0.26 (0.02 to 0.53)‡
C4 (T1 to onset, ≤1 y; remission to T3, >1 y) (n = 92)	11.80 (2.87)	10.75 (2.80)	−0.37 (−0.54 to −0.20)§

Abbreviations: See Table 1; C, remitted first-MDE group.
*Indicates premorbid and postmorbid total psychosocial disability scores in the remitted first-MDE group and the 4 subgroups with different premorbid and postmorbid periods.
†Owing to missing values (ie, onset or remission month not known), the subgroup numbers do not total 216.
‡$P=.049$.
§$P<.001$.

severity of psychosocial disability. The observed synchrony of change is consistent with longitudinal studies of clinical samples showing that psychosocial disability varies directly and largely as a function of the severity of depressive symptoms.[10-12,15-18] What our study adds to this literature is that this also holds for MDEs in the general population and for first and recurrent episodes separately.

Before-after episode comparisons of disability may suggest scarring if the premorbid period is longer than the postmorbid period and the opposite of scarring if the premorbid period is shorter. These misleading results are probably due to the state effects of prodromal and residual symptoms on psychosocial functioning, suggesting that synchrony of change is not limited to the MDE but extends to its prodromal and residual symptom phases. State effects develop and disappear probably gradually, in synchrony with the rise of prodromal and the fall of residual symptoms, respectively. We hypothesized that the few studies reporting scar effects[2,19] had on average longer premorbid than postmorbid periods, favoring an excess of residual symptoms at the postmorbid assessment compared with the prodromal symptom level at the premorbid assessment. Little is known about possible time lags in the synchrony of change between disability level and symptom severity.

The reader should evaluate our findings and interpretations in the context of 2 serious limitations. First, we did not measure current symptoms at the times we assessed psychosocial disability (T1, T2, and T3). Therefore, we could not examine whether the disability scores of respondents were increased in the absence of any symptoms. Hence, we cannot rule out that premorbid and postmorbid disability might be entirely due to (chronic) subthreshold symptoms. However, for 3 reasons we think that this is not the case and that our data support the notion of premorbid impairments in psychosocial functioning as an expression of trait vulnerability to depression. First, mild impairments were already present more than 1 year before the first lifetime MDE. Second, the existence of a trait effect is consistent with reports of psychosocial disability in patients during their asymptomatic phases.[12,19-21] Third, even if chronic subthreshold symptoms are present long before and after the MDE and account for the premorbid and postmorbid disability, it is more appropriate to consider chronic subthreshold symptoms and the associated disability as expressions of underlying trait vulnerability.

The second serious limitation is that we measured psychosocial disability with self-report questionnaires. The NEMESIS did not collect data from independent sources (family members and employers) or performance-based data (absenteeism and work productivity). Hence, we cannot discriminate between the competing explanations of increased self-reported disability, ie, real change vs reporting bias owing to the effects of depression symptoms on self-perception and recall processes.[36-38] We believe that real change is most likely. The few validity studies of self-reported psychosocial disability report substantial correlations between self-report measures and interview-,[27,35] performance-,[39] and employer-based[40] data. An advantage of our measures is that they directly assess functioning and are not weighted toward symptoms (eg, "to what extent has your health interfered with" measures).[41]

Other less serious study limitations include the retrospective assessment at T3 of the duration of the MDE,[34] thereby possibly introducing recall bias. Because treatment data are lacking, we cannot exclude that, at the group level, effective treatment may have improved functioning of some subjects so much that this has neutralized scar effects of nontreatment in others. Finally, we could not examine long-term adverse social outcomes like divorce and job failure.

Major strengths of our study include the sample size, the random population sample, the structured diagnostic assessment procedures, the largely nonselective attrition, and the prospective and longitudinal design made possible by assessment in 3 waves during a 3-year period. This way we could identify 216 individuals with a first lifetime MDE that started after the first assessment wave and remitted before the last one, avoid referral filter and lead time bias, and assess disability before, after, and during the MDE.

The occurrence of first MDEs in the population is common, with a 1-year incidence in the Netherlands of 1.72 for men and 3.90 for women per 100 at risk.[42] About 50% of these episodes do not remit within a few months and 20% last more than 2 years.[34] Hence, the finding that scarring does not occur routinely in major domains of functioning is good news, given the delay in treatment seeking[43] and noncompliance by patients and providers.[44,45] The bad news is that functioning was impaired long before and after the MDE. If treatments could ensure remission of the episode and achieve normal functioning, people experiencing depression might be better off substantially.

Submitted for publication August 2, 2002; final revision received November 10, 2003; accepted November 19, 2003.

This work was supported by the Netherlands Ministry of Health, Welfare and Sport, The Hague; the Netherlands Organization for Scientific Research, The Hague; and the National Institute for Public Health and Environment, Bilthoven, the Netherlands.

The analyses and writing of this article took place partly while Dr Ormel was a temporary fellow-in-residence at the Netherlands Institute for Advanced Study in the Humanities and Social Sciences. We thank the anonymous reviewers of the manuscript for their very helpful comments..

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