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Consequences of major and minor depression in later life: a study of disability, well-being and service utilization

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ABSTRACT

Background. The consequences of major depression for disability, impaired well-being and service utilization have been studied primarily in younger adults. In all age groups the consequences of minor depression are virtually unknown. In later life, the increased co-morbidity with physical illness may modify the consequences of depression, warranting special study of the elderly. With rising numbers of elderly people, excess service utilization by depressed elderly represents an increasingly important issue.

Methods. Based on a large, random community-based sample of older inhabitants of the Netherlands (55–85 years), the associations of major and minor depression with various indicators of disability, well-being and service utilization were assessed, controlling for potential confounding factors. Depression was diagnosed using a two-stage screening design. Diagnosis took place in all subjects with high depressive symptom levels and a random sample of those with low depressive symptom levels. The study sample consists of all participants to diagnostic interviews ($N = 646$).

Results. As in younger adults, associations of both major and minor depression with disability and well-being remained significant after controlling for chronic disease and functional limitations. Adequate treatment is often not administered, even in subjects with major depression. As the vast majority of those depressed were recently seen by their general practitioners, treatment could have been provided in most cases. Bivariate analyses show that major and minor depression are associated with an excess use of non-mental health services, underscoring the importance of recognition. In multivariate analyses the evidence of excess service utilization was less compelling.

Conclusions. Both major and minor depression are consequential for well-being and disability, supporting efforts to improve the recognition and treatment in primary care. However, controlled trials are necessary to assess the impact this may have on service utilization.

INTRODUCTION

There is a growing awareness that common mental conditions, such as depression, may contribute strongly to disability, impaired well-being and the use of health services by older people (Gurland, 1992; Von Korff *et al*. 1992; Ormel *et al*. 1993, 1994). So far, epidemiological studies have concentrated on charting the prevalence and risk factors involved with late-life depression. Potential consequences of depression, such as disability, impaired well-being and excess service utilization, which may be ranked among the key domains of public health, have received less attention in epidemiological research.

Disability and well-being

In the Medical Outcomes Study it was shown that impairment of well-being and functioning, uniquely associated with depression, was com-

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parable or worse than that uniquely associated with major chronic medical conditions (Wells *et al.* 1989; Hays *et al.* 1995). Disability and well-being have been defined and operationalized in various ways (WHO, 1980; Wells *et al.* 1989; Nagi, 1991; Gurland, 1992; Verbrugge & Jette, 1994). The well-known schema of the World Health Organization (WHO, 1980), has been adapted for operationalization in epidemiological studies by Verbrugge & Jette (1994) and Nagi (1991) (Fig. 1). In 'the disablement process', Verbrugge & Jette (1994) describe the pathways from pathology, through impairment, to functional limitation and disability. 'Pathology' includes physiological and biochemical abnormalities medically labelled as disease, injuries and congenital or developmental disorders. 'Impairment' consists of structural and functional abnormalities in specific body systems. 'Functional limitations' are restrictions in performing fundamental physical and mental actions used in daily life, such as limited mobility or memory. 'Disability' refers to difficulties experienced in performing necessary activities of daily living due to physical or mental health problems. While functional limitations refer to personal capabilities, disability refers to actual behaviour, evaluated relative to environmental demands. Disability can be manifest in both obligatory activities (such as personal care) or in discretionary spheres of life (such as leisure activities). Disability is described as the gap between personal capabilities on the one hand and personal standards or environmental demands on the other (Verbrugge & Jette, 1994; Deeg *et al.* 1995). Employing this scheme allows a study of the impact and the pathways through which depression is associated with disability, while taking account of pathology, impairment and functional limitations.

In later life, this is more compelling than in younger adults. Age-related changes in the interplay between depression and physical health justify questioning whether the results of previous studies, largely carried out among younger adults, are generalizable to later life. The prevalence, severity and complications of physical illness increase with age, thereby increasing the likelihood of encountering co-morbid affective and somatic disorders. It may be thought that, with age, physical disease plays a more dominant role in the disablement process, reducing the importance of depression. With regard to well-being, older people may adapt their personal standards and expectations to events and restrictions which occur normally in the life-cycle (Neugarten, 1970). Therefore, subjective well-being may be expected to be relatively independent of changes in physical health in later life.

The use of health services

With regard to service utilization, reference is made to both excess use and under-use of appropriate health services. Although depression is a treatable disorder, several studies have provided evidence that recognition and provision of adequate treatment in primary care and in other medical settings is rather poor (Goldberg & Bridges, 1988; Copeland *et al.* 1992; Kirmayer *et al.* 1993; Rovner, 1993). Depression is often considered to be one of the potentially amenable factors involved in the pathways to disability and impaired well-being in which too little use of appropriate health services is made (National Institute of Health, 1992). Other studies have suggested that depression is associated with an excess utilization of non-mental health services (Craig & van Natta, 1978; Koenig *et al.* 1988; Kempen & Suurmeyer, 1991). It appears that services appropriate for the treatment of depression are underused, while there is excess use of other health services. Andersen & Newman (1973) have developed a conceptual framework for service utilization, which has proved very useful in community-based studies in the elderly (Branch *et al.* 1981; Wolinsky & Arnold, 1988; Kempen & Suurmeyer, 1991). This model distinguishes predisposing, enabling and need-for-care variables. 'Need-for-care' includes the four elements constituting the disablement process. 'Enabling' are those factors which facilitate or hinder the use of appropriate health services, such as financial status, access to medical insurance and non-professional social support. 'Predisposing' variables refer to background circumstances, such as age, sex and level of education, which influence attitudes and beliefs concerning health and use of services. An assessment of the role played by depression in the use of health services should therefore take

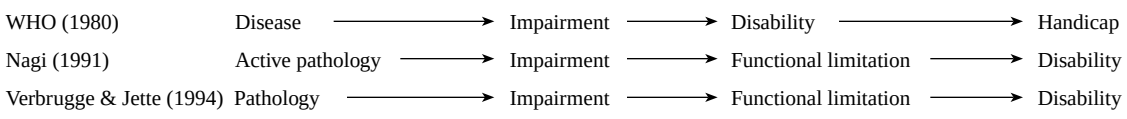

FIG. 1. The disablement process.

its association with the disablement process into account. In previous studies of the elderly, need-for-care was dominant in its associations with service utilization, leaving but a modest role for predisposing and enabling factors (Kempen & Suurmeyer, 1991).

Depression

Results of epidemiological studies involving late-life depression are often difficult to interpret, due to a lack of consensus on issues of definition and criteria for diagnosis (Snowdon, 1990; Blazer, 1994). It appears that major depression, rigorously defined by DSM criteria, is relatively rare among the elderly, while pervasive depressive syndromes not fulfilling rigorous diagnostic criteria (minor depression) are more common (Blazer 1994; Beekman *et al.* 1995*a*). In previous studies among the elderly, it was found that both the incidence and the course of minor depression are closely related to physical health (Phifer & Murrell, 1986; Kennedy *et al.* 1989; Beekman *et al.* 1995*b*), while about 50% run a chronic course (Kennedy *et al.* 1991; Copeland *et al.* 1992; Beekman *et al.* 1995*b*). In contrast, previous analyses of the Longitudinal Aging Study Amsterdam (LASA) showed that major depression was much less strongly related to physical health (Beekman *et al.* 1995*a*, 1997*a*). Instead, major depression was more closely related to long-standing vulnerability factors, such as family and personal histories of depression. Associations of late-life depression with disability, well-being and service utilization should, therefore, be studied separately for major and minor depression.

The principal aim of the present study was to assess the impact of major and minor depression on three key public health domains in older people: well-being, disability and the use of health services. To our knowledge, this is the first community-based study of the elderly, systematically comparing consequences of major and minor depression. In keeping with previous findings, we hypothesized that both major and minor depression contribute to disability, impaired well-being and service utilization, but through different pathways. Minor depression was thought to be intimately associated with physical health at all stages of the disablement process. The associations of minor depression with disability and well-being were therefore expected to be: (1) partly dependent on pathology and functional limitation; and (2) partly unique to minor depression. In contrast, the asssociations of major depression with disability and well-being were hypothesized to be largely independent of pathology and functional limitation.

With regard to service utilization, it was hypothesized that depression was associated with both undertreatment and an excess use of services not specifically designed for the treatment of depression. In minor depression the pathways leading to use of non-mental-health services were expected to be largely dependent on the level of disablement. In major depression, the excess use of services was expected to be largely independent of disablement. The implications of our findings for clinical practice will be discussed in the conclusion of the paper.

METHOD

Sampling and procedures

The Longitudinal Aging Study Amsterdam (LASA) is a 10-year longitudinal study on predictors and consequences of changes in well-being and autonomy in the older population (Deeg *et al.* 1993). Full details on sampling and response are described elsewhere (Beekman *et al.* 1995*a*). In short, a representative random sample of older (55–85) persons, stratified for

age and sex, was drawn from the population registers of 11 municipalities in three regions in the Netherlands. The sample was used in two studies. Respondents were first interviewed for the NESTOR program Living arrangements and Social Networks of older adults (response 62·3%) (Broese *et al.* 1995). About 10 months later, 3107 (81·7%) of the 3805 respondents to the NESTOR-LSN study took part in the LASA baseline interview. Non-response was related to age ($P < 0{\cdot}001$), but not to sex. The older old were more often found to be too ill or cognitively impaired to participate. Due to item non-response a further 51 subjects were lost, leaving a baseline sample of 3056.

Depression was diagnosed using a two-stage screening design, which has been described in detail elsewhere (Beekman *et al.* 1997*b*). In the first stage, all participants to the baseline interview were screened for depression, using the Center for Epidemiologic Studies Depression scale (CES-D, Radloff, 1977). The second stage of case-finding took place in an additional interview, scheduled 2 to 8 weeks after LASA-baseline. All subjects scoring $\geqslant 16$ on the CES-D at baseline and a similarly sized random sample of those scoring < 16 were approached for the diagnostic interviews. Response was 86·0% relative to LASA baseline. Again, response was related to age ($P < 0{\cdot}001$), but not to sex. In total 646 complete diagnostic interviews were obtained, of which 324 (50%) in subjects scoring above the cut-off on the CES-D. For this paper, all subjects in whom a diagnostic interview was completed constitute the study sample ($N = 646$).

The informed consent obtained from all subjects prior to the study conforms to standards set by current Dutch legislation. All interviews were conducted in the homes of respondents by specially trained and intensively supervised interviewers. Two sets of interviewers were recruited and trained for the baseline and diagnostic interviews respectively, ensuring that screening and diagnosis of depression were not administered by the same interviewer. All interviews were tape-recorded in order to control the quality of the data. Interviewers worked with laptop computers and were encouraged to record any disturbance in the course of the interview. Interviews were conducted between October 1992 and September 1993.

Measures

Depression

Major depression

The six-month prevalence of major depression was defined according to DSM-III criteria, and operationalized using an adapted version of the Diagnostic Interview Schedule (DIS, Robins *et al.* 1981). The DIS is a criterion instrument which was designed specifically for use in epidemiological studies and has been used widely in elderly samples.

Minor depression

This was defined as all clinically relevant depressive syndromes, not fulfilling rigorous diagnostic criteria for major depression (Blazer, 1994). In order to identify respondents with levels of depression which are clinically relevant, we used the generally used cut-off score $\geqslant 16$ on the CES-D (Radloff, 1977; Beekman *et al.* 1994). The CES-D is a 20 item self-report scale developed to measure depressive symptoms in the community. It has been widely used in older community samples, and has good psychometric properties in elderly samples (Himmelfarb & Murrell, 1983; Radloff & Teri, 1986; Hertzog *et al.* 1990). The Dutch translation had similar psychometric properties in three previously studied samples of elderly in the Netherlands (Beekman *et al.* 1994). Criterion validity for major depression was very good (sensitivity 100%, specificity 88%) (Beekman *et al.* 1997*b*). The overlap with symptoms of physical illness has been shown to be minimal in a number of studies (Berkman *et al.* 1986; Foelker & Schewchuk, 1992).

The disablement process

Pathology was measured using a detailed questionnaire on chronic physical diseases (CBS, 1989). Specific questions were asked considering the presence, duration, principal symptoms, complications and the treatment of chronic lung diseases (asthma, bronchitis and pulmonary emphysema), cardiac diseases, atherosclerotic disease of the abdominal aorta and the arteries of the lower limbs, stroke (excluding transient ischaemic attacks), diabetes mellitus, malignant neoplasms, osteoarthritis and rheumatoid arthritis. Other chronic diseases were assessed in less detail (Kriegsman *et al.* 1996). In order to

estimate the potential effect of misclassification due to self-report data, the presence of chronic diseases was cross-checked with general practitioners. In a study of concordance between the respondents' reports and data supplied by general practitioners, it was found that agreement between subjects and their GPs did not depend on depressive symptom levels (Kriegsman *et al.* 1996).

As described, impairment constitutes the next stage in the disablement process. However, aside from the level of cognitive impairment, which was measured using the Mini-Mental State Examination (Folstein *et al.* 1975), specific impairments were not measured in a way allowing them to be fitted in the Verbrugge & Jette model of the disablement process. Impairment has, therefore, been deleted from the model. Functional limitations were measured using an ADL-scale previously validated in the Netherlands (van Sonsbeek, 1988). Disability was first assessed in terms of general functioning (bed-days, disability days), using questions derived from the Medical Outcomes Studies (Anderson *et al.* 1990). Five specific areas of functioning subject to study included daily physical activities (household work, going for walks, cycling, Caspersen *et al.* 1991), social participation (van Rijsselt, 1994) and sexual life (Deeg *et al.* 1993).

Well-being

Measures of well-being included general satisfaction with life (CBS, 1989) and self-perceived health (CBS, 1989).

Service utilization

A wide range of health services generally available in the Netherlands was assessed (Bosma, 1988). Measures were based on self-report. Included were recent visits to physicians (general practitioners, medical specialists, psychiatrists), paramedical services (physiotherapy, social work, home nursing), formal social support (home help), and alternative healers. In the assessment of hospital admittances, psychiatric hospitalizations were disregarded due to their low occurrence. Ancillary services included the provision of meals (meals on wheels) and medically subsidized transport. Medication use was ascertained by inspecting bottles of currently used prescriptions at the home-visit by the interviewers. Perceived sufficiency of services provided was included as a subjective measure of satisfaction with health services.

In the analyses concerning the use of services, the data were fitted to the Andersen–Newman model. In this model, 'need-for-care' encompasses all the elements of the disablement process. It was, therefore, operationalized using the variables previously described in the disablement process. Enabling variables included were urbanicity of the residence, marital status, the size of the contact network, and the amount of both instrumental and emotional support received from network members other than the partner (van Tilburg *et al.* 1992). Access to insurance systems was not included, because coverage is practically 100% in the Netherlands. Income was disregarded because of the large number of missing values on this item, and because it was not consequential for service utilization in previous studies in the Netherlands (Kempen & Suurmeyer, 1991).

Predisposing variables included were age, sex and level of education. These demographic variables were also used as controls in the analyses pertaining to disability and well-being. All scales were either previously validated in comparable samples in the Netherlands, or in LASA pilot studies (Deeg *et al.* 1993).

Data-analysis

In all analyses, different indicators of disability, well-being and service utilization were the dependent variables, while either major or minor depression was one of a set of independent variables. First, in bivariate analyses, odds ratios for disability, well-being or service utilization associated with either major or minor depression were calculated. For these analyses all dependent variables were dichotomized. The 95% confidence intervals were calculated in all cases. In order to compare the impact of major and minor depression, subjects with major depression were excluded when minor depression was under study and vice versa. In this way, major and minor depression were both contrasted with the same, non-depressed control group.

Bivariate analyses are likely to produce spurious results. Therefore, multivariate controls were instigated, using logistic regression models. In analyses pertaining to 'disability and well-being', odds ratios were calculated controlling

for demographic variables, chronic diseases and functional limitations. At all stages of the disablement process associations between depression and declining physical health may occur. In cross-sectional analyses it is impossible to disentangle the causal pathways involved. However, the results of hierarchic logistic regression modelling may be used to reach tentative conclusions with regard to the interplay between the relevant variables. In the models, demographic variables and either major or minor depression were entered as a first set of independent variables; next the number of chronic diseases and finally functional limitations. Results allow comparison of the degree to which the associations of major and minor depression with well-being and disability depended on pathology and functional limitation.

In analyses pertaining to service utilization a similar multivariate analytical strategy was adopted. Using logistic regression models, odds ratios were calculated, controlling for the need-for-care, enabling and predisposing factors of the Andersen–Newman model. The pathways involved in major and minor depression were explored using hierarchical logistic regression models. In these analyses the predisposing and enabling variables were entered as a first set of independent variables, next either major or minor depression, and finally the need-for-care variables. This order was chosen because it allows comparing the degree to which major and minor depression depend on pathology, functional limitation and cognitive impairment in their associations with service utilization.

RESULTS

Characteristics of the sample and basic associations

In Table 1, demographic and health-related characteristics of the sample are shown. Due to the sampling procedure men and women were roughly evenly represented. The higher proportion of older old reflects the intended even distribution of subjects 5 years into the study. The relatively high number of subjects unmarried, with cognitive impairment or physical health problems is a function of oversampling among the older old. It also shows that attrition has not caused the sample to become a sample of 'healthy elderly'. The low percentage in institutions reflects selective non-response. The high percentage with major and minor depression reflects the stratification of the study-sample. In the baseline sample the prevalence of major depression was estimated at 2·0% and of minor depression at 12·9% (Beekman *et al*. 1995*a*).

Disability

In Table 2, bivariate associations with major and minor depression are shown for various dimensions of disability. Associations were strongest with general functioning, while associations with specific areas of functioning were generally weaker. Comparing major and minor depression, associations were mostly stronger in minor depression. This is reflected by the number of variables which were significantly associated with minor, but not with major depression (heavy household work, going for walks, cycling, attending meetings of organizations, recrea-

Table 1. *Characteristics of the sample studied*

Characteristic	*N* (%)
Age	
55–64	203 (31·4)
65–74	187 (28·9)
75–85	256 (39·6)
Sex	
Male	272 (42·1)
Female	374 (57·9)
Level of education	
Low	284 (44·0)
Middle/high	362 (56·0)
Urbanicity	
Living in Amsterdam	200 (31·0)
Living elsewhere	446 (69·0)
Marital status	
Married	345 (53·4)
Not/no longer married	301 (46·6)
Living arrangement	
Independent	617 (95·5)
Old age residence	28 (4·3)
Nursing home	1 (0·2)
Depression	
Not depressed	320 (59·5)
Minor depression	267 (41·3)
Major depression	59 (9·1)
Cognitive functioning	
MMSE $\geqslant 24$	542 (84·3)
MMSE < 23	101 (15·7)
Chronic physical illness	
None	187 (29·0)
One	220 (34·2)
Two or more	237 (36·8)
Functional limitations	
None	331 (51·7)
One or more	309 (48·3)

Table 2. *Disability and well-being: bivariate associations with major and minor depression*

Dependent variable	Major depression OR 95% CI	Minor depression OR 95% CI
General functioning		
Bed-days past month	4·85 (2·16–10·9)	4·29 (2·38–7·75)
Limited activities due to health	5·18 (2·60–10·31)	5·54 (3·42–8·98)
Specific activities impaired past 2 weeks		
Light household work	0·69 (0·20–2·37)	1·44 (0·81–2·54)
Heavy household work	1·57 (0·87–2·84)	2·71 (1·92–3·84)
Going for walks	1·83 (0·84–3·96)	3·06 (1·96–4·80)
Cycling	1·17 (0·65–2·10)	2·09 (1·47–1·92)
Visiting meetings/organizations	1·46 (0·79–2·69)	1·73 (1·22–2·86)
Recreational outings	1·36 (0·73–2·52)	2·07 (1·45–2·94)
Visits pub/tavern/restaurant	1·35 (0·75–2·42)	1·39 (0·99–1·94)
Sexual life		
Sex not important	1·95 (0·94–4·04)	2·28 (1·53–3·40)
Sex unpleasant or not applicable	2·01 (0·90–4·46)	2·06 (1·36–3·11)
Well-being		
Perceived health	6·13 (3·25–11·54)	4·63 (3·27–6·57)
Not satisfied with life	35·34 (15·50–80·57)	9·30 (5·23–16·54)

Table 3. *Disability and well-being: associations with major and minor depression in multivariate analyses**

Dependent variable	Major depression OR 95% CI	Minor depression OR 95% CI
General functioning		
Bed-days past month	3·46 (1·37–8·74)	3·82 (2·02–7·21)
Limited activities due to health	3·85 (1·82–8·16)	4·88 (2·91–8·19)
Specific activities		
Light housework	0·68 (0·18–2·66)	1·16 (0·58–2·32)
Heavy housework	1·45 (0·73–2·90)	1·68 (1·09–2·59)
Going for walks	1·07 (0·43–2·67)	2·27 (1·38–3·74)
Cycling	0·84 (0·42–1·70)	1·15 (0·76–1·74)
Visits meetings/organizations	1·44 (0·75–2·78)	1·40 (0·94–2·07)
Recreational activities	1·19 (0·58–2·47)	1·38 (0·91–2·08)
Visits pub/tavern/restaurant	1·41 (0·76–2·61)	1·18 (0·81–1·72)
Sexual life		
Sex unimportant	1·26 (0·52–3·09)	1·10 (0·67–1·81)
Sex unpleasant	1·77 (0·56–4·89)	0·99 (0·59–1·69)
Well-being		
Perceived health	5·58 (2·61–11·95)	3·20 (2·08–4·90)
Dissatisfied with life	38·03 (14·96–96·70)	7·52 (4·03–14·03)

* Logistic regression analyses, controlling for age, sex, level of education, urbanicity, marital status, number of chronic diseases and functional limitations.

tional activities and both variables relating to sexual life). However, as the number of subjects with major and minor depression differed, significance levels may be misleading. Comparing strengths of associations, the odds for impaired functioning were mostly higher for minor depression, but never outside the 95% confidence intervals for major depression.

In Table 3, results of multivariate analyses are shown, controlling for demographic variables, pathology and functional limitations. Again, associations were strongest in variables reflecting general functioning. Subjects with major or minor depression were at a high risk for impaired general functioning. In the more specific areas of functioning unique associations with major and minor depression were either non-significant or weak. The odds ratios for disability were somewhat higher in minor depression in many cases, although well within the 95% confidence intervals of major depression. Associations with sexual life were no longer significant.

Hierarchical logistic regression models were used to compare the degree to which major and minor depression depend on pathology and functional limitations in their associations with disability (analyses not shown). In these analyses, different indicators of disability were the dependent variable, while either major or minor depression was included as one of a set of independent variables in regression models. Both major and minor depression had strong bivariate associations with bed-days (Table 2). Controlling for pathology and functional limitations reduced the strength of these associations only slightly. In major depression, the same pattern was found for all other indicators of disability under study. In minor depression the situation was rather different. Here associations with five specific areas of functioning (light household work, cycling, attending meetings, recreational activities and importance of sex) lost significance when controlling for pathology and functional limitations.

Table 4. *Treatment of depression across depressive status*

	Not depressed %	Minor depression %	Major depression %
Antidepressants	1	3	19
Benzodiazepines	10	23	39
Visits psychiatrist	1	3	15
Visits social worker	1	4	16
Visits community mental health centre	2	3	10

Well-being

As expected, bivariate associations of both major and minor depression with well-being were very strong. Table 2 shows that the odds of impaired well-being were highest in subjects with major depression (odds of major depression higher and outside the 95% confidence intervals of minor depression). Table 3 shows that all associations remained strong after controlling for pathology and functional limitations. Moreover, in the analyses involving major depression, depression was the sole determinant of satisfaction.

Service utilization in major and minor depression

Evidence of treatment

Visits to community mental health centres, psychiatrists or social workers, and the use of antidepressants or benzodiazepines were taken as evidence that treatment of depression may have been instigated. In Table 4, the percentage of subjects possibly treated for depression is shown by levels of depression. In Table 5, bivariate analyses involving all services under study are summarized. The results show that

Table 5. *Service utilization: bivariate associations with major and minor depression*

Dependent variable	Study sample %	Major depression OR 95% CI	Minor depression OR 95% CI
Contacts past 6 months			
General practitioner	78·9	1·93 (0·91–4·10)	1·83 (1·21–2·76)
Medical specialist	54·5	1·57 (0·88–2·80)	1·76 (1·26–2·47)
Psychiatrist*	2·9	17·42 (4·46–68·0)	3·00 (0·77–11·71)
Physiotherapist	22·3	2·92 (1·55–5·50)	2·52 (1·67–3·80)
Social worker*	3·3	28·65 (6·01–136·6)	6·14 (1·33–28·28)
Home nursing	5·2	7·33 (1·91–28·20)	7·74 (2·65–22·61)
Home help	10·0	3·20 (1·29–7·94)	3·66 (1·98–6·78)
Alternative practitioner	4·2	4·19 (1·52–11·50)	1·20 (0·49–2·92)
Hospital admission past 6 months	12·4	2·73 (1·26–5·92)	2·03 (1·20–3·44)
Visits community mental health centre past 6 months*	3·0	1·40 (0·47–4·22)	5·96 (1·85–19·19)
Current use of medication			
Any medication	76·9	4·91 (1·91–12·65)	2·30 (1·54–3·44)
Antidepressants*	3·6	18·1 (5·54–59·15)	2·44 (0·73–8·2)
Benzodiazepines*	17·8	5·75 (3·04–10·88)	2·61 (1·64–4·15)
Ancillary facilities (6 month)			
Meals on wheels	4·7	4·14 (1·27–13·52)	3·21 (1·32–7·81)
Transport	3·9	9·92 (3·12–31·53)	2·94 (1·02–8·46)
Subjective			
Insufficient help	5·3	15·82 (2·99–83·79)	15·16 (3·53–65·11)

* Variables indicating that treatment of depression may have been instigated.

Table 6. *Service utilization: associations with major and minor depression in multivariate analyses**

Dependent variable	Major depression OR 95% CI	Minor depression OR 95% CI
Contacts past 6 months		
General practititoner	1·43 (0·62–3·30)	1·50 (0·92–2·46)
Medical specialist	1·30 (0·66–2·56)	1·25 (0·84–1·86)
Psychiatrist†	15·47 (2·89–82·7)	1·62 (0·34–7·82)
Physiotherapist	1·71 (0·79–3·70)	2·18 (1·36–3·50)
Social worker†	50·83 (5·67–455·3)	6·43 (1·15–36·0)
Home nursing	6·95 (1·33–36·4)	3·94 (1·24–12·5)
Home help	1·81 (0·44–7·45)	1·49 (0·72–3·09)
Alternative practitioner	3·37 (0·95–12·0)	1·68 (0·62–4·52)
Hospital admission	2·08 (0·83–5·20)	1·27 (0·70–2·29)
Visits community mental health centre†	10·15 (2·17–47·6)	1·21 (0·33–4·49)
Use of medication		
Any medication	4·03 (1·45–11·2)	1·19 (0·73–1·94)
Antidepressants†	25·93 (5·71–117·8)	1·84 (0·49–6·99)
Benzodiazepine†	6·09 (2·85–13·0)	2·06 (1·21–3·52)
Use of facilities		
Meals on wheels	5·50 (0·93–32·7)	2·45 (0·87–6·91)
Transport	12·86 (1·96–84·6)	1·93 (0·56–6·70)
Subjective		
Insufficient help	35·60 (2·26–560·3)	6·88 (1·45–32·6)

* Logistic regression analyses, controlling for predisposing variables (age, sex, level of education), enabling variables (urbanicity, marital status, the size of the contact network, the amount of emotional and instrumental support received), and need-for-care (the number of chronic diseases, functional limitations, cognitive impairment).

† Variables indicating that treatment of depression may have been instigated.

antidepressants and referrals to community mental health centres, social workers or psychiatrists were used sparingly. In both major and minor depression benzodiazepines were used more frequently than antidepressants. Table 6 shows the results of multivariate analyses. Comparing the results of bivariate and multivariate analyses shows that the pattern of use remained essentially unchanged by including controls. All odds ratios remained higher in major than in minor depression. Moreover, in minor depression the odds of having consulted a psychiatrist or using antidepressant medication were not significantly higher than in the non-depressed.

The use of other health services

In the study-sample as a whole, almost 80% had visited their GP during the past 6 months, while about 50% had visited medical specialists and 12% had been admitted to general hospitals (Table 5). About 80% were using medication. This again shows that attrition has not led to a sample of healthy elderly and that the variables studied are well represented in the material. The large majority were satisfied with the services offered. Table 5 also summarizes the bivariate associations of major and minor depression with the use of services under study. Subjects with both major and minor depression appeared to be rather heavy utilizers across the services. Comparing significant findings in major and minor depression, there were only a few differences. The odds of visiting GPs or medical specialists were raised in minor, but not in major depression. Seeing alternative practitioners was more likely in major, but not in minor depression. Comparing strengths of associations, major and minor depression appeared to carry very similar risks of service utilization. In major depression the odds were higher for seeing alternative practititoners, for using any medication and for the use of medically subsidized transport (odds ratios in major depression higher and outside the 95% confidence intervals of minor depression). In contrast with the generally high level of satisfaction, the odds for being dissatisfied with the services offered were very high in both major and minor depression. In Table 6 the results of logistic regression analyses are shown, controlling for predisposing, enabling and need-for-care variables. As expected, the odds for using non-mental health services were greatly reduced when controls were intro-

duced. The only significant findings that remained involved the use of home-nursing, any medication and transport facilities in major depression; and the use of physiotherapy and home-nursing in minor depression. Comparing strengths of associations, the only differences remaining between major and minor depression were higher odds for use of any medication and transport facilities in major depression.

Hierarchical logistic regression models were used to compare the degree to which major and minor depression depend on the other factors of the Andersen–Newman model in their association with service utilization (analyses not shown). In these analyses different indicators of service utilization were the dependent variable, while either major or minor depression was one of a set of independent variables. Controlling for predisposing and enabling variables, minor, but not major depression was associated with a higher likelihood of consultations with GPs. However, controlling for need-for-care (chronic diseases, functional limitations and cognitive impairment), this association was no longer significant. In concordance with the literature (Kempen & Suurmeyer, 1991), this was the pattern we expected to find for most services. However, it was only found for visits to GPs. In the other services studied, predisposing, enabling and need-for-care variables made independent contributions to service utilization.

DISCUSSION

The results confirm previous findings that link depression to disability, impaired well-being and service utilization. The impact of depression on these three important domains of public health seems to remain unchanged in later life. Moreover, similar to previous studies carried out in younger samples, associations remained significant after controlling for chronic disease and functional limitations. The higher prevalence of chronic disease and functional limitations in the elderly does not appear to reduce the role of depression in the disablement process.

Disability and well-being

The results showed that major and minor depression appear to carry similar risks for disability and impaired well-being. Minor depression is very common in later life (Blazer, 1994). Although closely related to physical health at all levels of the disablement process, minor depression does have important independent associations with both disability and well-being. The exact pathways probably vary across patients and may even vary within patients over time. As was hypothesized by Gurland *et al.* (1988) and Prince *et al.* (1997), and as was shown in younger adults by Aneshensel *et al.* (1984), reciprocal relations may exist, through which depression and disablement exhibit a circular, mutually enforcing influence on each other. Interrupting this chain of mutually enforcing disorders at any point may improve both well-being and functioning. In cases where there is limited scope of treatment of the physical condition, it may be worth while to treat the associated depression, even if rigorous diagnostic criteria for major depression are not fulfilled.

Previous studies showed that major depression was not associated with chronic diseases or functional limitations (Beekman *et al.* 1995*a*, 1997*a*). Major depression, therefore, appears to be quite independent of physical health in its associations with well-being and disability. Extrapolating this finding to clinical work suggests that, in major depression, primary treatment of depression is probably indicated in all cases, whether or not there are co-morbid medical conditions.

In multivariate analyses, pathology and functional limitations were not significantly associated with life-satisfaction. This supports the idea that deteriorating physical health is an 'on-time' event (Neugarten, 1970), which is expected and therefore does not lead to dissatisfaction. In contrast, both major and minor depression were strongly associated with dissatisfaction.

Service utilization

In the Netherlands, there are few financial constraints limiting the use of health services. The services under study are generally available throughout the country. The Andersen–Newman model is well-suited to study service utilization. However, in the Netherlands a referral of a GP is necessary for most of the services listed. GP-related factors influencing referral behaviour, such as attitudes about

ageing and mental problems were not available in the present study. This severely limits uncovering the mechanisms that result in service utilization. However, the object of the study was to assess the use of services across depressive status. Depression was expected to be associated with both undertreatment and an excess use non-mental health services. Regarding treatment, the available data support the idea that adequate treatment is not administered in the majority of depressed elderly. This is not due to depressed elderly withdrawing from the health services. The vast majority of those depressed were seen by their GPs, indicating that they could be treated rather easily. Moreover, in both major and minor depression, benzodiazepines were used more frequently than antidepressants. These findings indicate that some form of mood disturbance was recognized by GPs in many cases, but that no attempt was made at more formal psychiatric diagnosis or treatment. Table 4 also shows that treatment was mainly restricted to cases of major depression. Compared with minor depression, major depressive episodes were more severe, less often associated with physical illness and more often occurring in subjects with a history of major depression (Beekman *et al.* 1995*a*). These three factors (severity, co-morbidity and psychiatric history) may be key variables involved in the recognition, diagnosis and treatment of depression by general practitioners. No data are available on the provision of psychotherapeutic treatment of depression. However, psychotherapies with a proven efficacy in late-life depression, such as interpersonal psychotherapy (IPT) and cognitive therapy, are practically unavailable in primary care in the Netherlands.

In bivariate analyses concerning non-mental health services, both major and minor depression appear to be associated with considerable risks of excess utilization. The depressed elderly represent a group of rather heavy users of services. Depression may interfere with the delivery of medical care, for instance through a lack of motivation and compliance of depressed patients. This underscores the importance of the recognition of depression in non-mental health settings. In multivariate analyses, controlling for predisposing, enabling and need-for-care variables, the evidence of excess service utilization was less compelling. Furthermore, patterns of non-mental service utilization were very similar in major and minor depression. Hypotheses regarding the differential patterns of service utilization in major and minor depression were not upheld by the data.

Limitations

The present study relied on self-reported measures of all variables. Some concern about recall and report bias, in which depressed subjects may systematically remember and report more negatively about their functioning, well-being, physical health and about the services offered to them is warranted. Report and recall bias may artificially raise associations of depression with all important variables. However, this bias should be more evident as severity of depression increases. On the whole, strengths of associations of minor (mostly mild) and major (more severe) depressions with functioning, well-being and service utilization were very similar. Indeed, associations with chronic disease and functional limitations were highly significant in minor, but not significant in major depression. This, together with the finding that concordance between self-reported data on chronic disease and data supplied by GPs was not related to depression, indicates that the results presented are not artefacts caused by recall or report bias.

A second potential source of bias is represented by the more severely ill elderly selectively leaving the population under study. Oversampling in the more vulnerable strata has resulted in considerable non-response. Both through excess mortality and a higher non-response in subjects with more compromised health status, the sample studied may selectively under-represent the more frail elderly. This is borne out by the low number of institutionalized elderly which could be included in the study. If this loss of subjects were concentrated in those who are both physically ill and depressed, the associations found would be artificially weakened. However, Tables 1 and 5 show that the sample has certainly not become a sample of 'healthy elderly'. All determinants of well-being, disability and service utilization used in the analyses were well-represented and controlled for. This limits, but cannot exclude bias due to non-response.

A third limitation is that the data are cross-sectional, precluding any definite conclusions regarding causal relationships between variables. However, even in longitudinal designs, it may prove very difficult to uncover the causal pathways involved in the interplay between physical health and depression. In younger adults, using a multiwave longitudinal design, Aneshensel *et al*. (1984) showed that physical illness has a large simultaneous efect of increasing depressive symptomatology, while depression has a smaller, 4 month lagging effect of increasing physical illness, suggesting a reinforcement cycle operating over time. This is one of the very few available studies allowing causal inferences to be made.

The present findings suggest that adequate treatment of depression could be provided rather easily, but is not often administered. The relatively high rate of benzodiazepine use in those depressed probably indicates that GPs do recognize that there is something amiss with their depressed elderly patients, but that they do not go on to diagnose and treat depressive disorders. The development of brief modules for the diagnosis and treatment of late-life depression, geared to the specific circumstances of working in a primary care setting, may help to improve the provision of adequate treatment. Treatment may be expected to lead to improved functioning and well-being, especially in subjects with major depression. It is tempting to assume that improved functioning and well-being may, in turn, lead to a decrease in the use of non-mental health services. Thinking along these lines, one may argue for systematic treatment of late-life depression in primary care, thereby aiming to improve three key domains of public health. However, the unique associations of both major and minor depression with service utilization were not very strong. This tempers the idea that systematic treatment of depressed elderly in primary care could influence service utilization. To assess the public health effects of systematic treatment of depression in primary care, the present observational, cross-sectional data are inadequate. Controlled trials in primary care are needed in order to settle this issue.

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