

# Prevalence and Correlates of Depression in an Aging Cohort: The Alameda County Study

Robert E. Roberts,<sup>1</sup> George A. Kaplan,<sup>2</sup> Sarah J. Shema,<sup>3</sup> and William J. Strawbridge<sup>3</sup>

<sup>1</sup>The University of Texas at Houston Health Science Center, School of Public Health.

<sup>2</sup>Human Population Laboratory, California Department of Health Services.

<sup>3</sup>California Public Health Foundation.

*Data on symptoms of major depressive episodes were examined for the 1994 cohort (n = 2,417) of the Alameda County Study (mean age = 65). In addition to age, we examined gender, education, marital status, social isolation and social support, perceived physical and mental health, chronic medical conditions, functional impairment, life events, financial strain, and neighborhood quality. The point prevalence of symptoms of major depressive episodes was 6.6 percent for men and 10.1 percent for women, with a trend for prevalence to increase with age. When the effects of the other psychosocial risk factors were controlled, there were no significant age effects. Multivariate analyses demonstrated that apparent initial age effects were due almost entirely to chronic health problems and functional impairment. The implications are clear: Healthy, normal-functioning older adults are at no greater risk of depression than younger adults. Apparent age-related effects on depression are attributable to physical health problems and related disability.*

DEPRESSION is a major public health problem in the United States. For example, the Medical Outcomes Study found that the impairment and disability associated with depression is equal to that attributable to cardiovascular disease, and greater than that due to other chronic physical disorders such as hypertension, diabetes, and arthritis (Wells et al., 1989). The economic cost has been estimated to be more than \$40 billion per year for depression and more than \$270 billion for all psychiatric disorders (Greenberg et al., 1993; Rice et al., 1990).

Depression also is a common mental health problem among older persons. Community-based, epidemiologic studies report rates of clinical depression in samples of older adults in the range of 1–16 percent. Like most disorders in most studies, prevalence rates for depression vary considerably depending on the sample studied and methods used. For example, Gurling et al. (1995a) note that studies using DSM-III-R diagnostic criteria (American Psychiatric Association, 1987) generally yield lower prevalence rates for major depressive disorder in older populations. Studies that focus on symptoms of depression report much higher prevalences than do studies using diagnostic procedures. For example, studies using the Diagnostic Interview Schedule (DIS) and DSM criteria have tended to generate prevalence rates for major depressive disorder on the order of 1 to 3 percent (see Bland, Newman, and Orn, 1988; Blazer and Williams, 1980; Weissman et al., 1985), whereas studies using instruments designed specifically for use with older persons have reported prevalences of 11 to 16 percent for older subjects who have significant depressive symptoms but who do not meet diagnostic criteria for major depression (see Copeland et al., 1987; Kay et al., 1985; Livingston et al., 1990).

From an epidemiologic perspective, the question of whether increasing age constitutes increasing risk for the

experience of depression remains unclear. Indeed, divergent results from epidemiologic investigations resulted in a 1990 commentary by Snowdon (1990) in which he noted that the results of prevalence surveys of depression among older persons can be grouped into low prevalence studies and high prevalence studies based on measurement strategy. Those that have used the DIS and/or DSM criteria yield much lower rates of depression than do those using other procedures. He argues that dementia, disability, physical illness, bereavement, loss of independence and security, and suicide all are much more common in old age, and therefore prevalence of depression should increase as well. However, others have pointed out that older persons may experience many of the symptoms of depression, although not at the threshold required to meet diagnostic criteria (see Blazer, 1993; Blazer, Hughes, and George, 1987).

There actually have been few studies of depression among the very old, even though this segment of the population is one of the fastest growing. The few studies that have been done report disparate prevalences for major depression ranging from less than 3 percent to over 12 percent (see Gurling et al., 1995a; Skoog et al., 1993).

The mental and physical health of a community sample in Alameda County, California, has been studied for over 28 years. In 1994, a fourth wave of data was collected on subjects 46–102 years of age. As part of this follow-up study, data on major depression were obtained using DSM-III-R criteria. In addition, extensive data on putative risk factors were collected, including data on cognitive impairment and social and physical functioning. These data permit reexamination of the effects of age on depression.

Using data from the 1994 survey, we estimate symptom prevalence of DSM major depression in the Alameda County Study cohort and examine associated risk factors,

in particular age effects, in a cohort 50 years and older. We examine age trends in major depression and the contribution of other putative risk factors: gender, marital status, socioeconomic status, physical health and disability, life stress, and social support.

## METHODS

### Sample

The sample was drawn from the Alameda County Study, a longitudinal study of physical and mental health and mortality that has followed a cohort of 6,928 persons selected in 1965 to represent the adult noninstitutionalized population of Alameda County, California. Subjects are followed regardless of subsequent location or disability status. Survivors have been interviewed in 1974, 1983 (50% sample), and 1994 with response rates of 85 percent, 87 percent, and 93 percent, respectively. Detailed design and sampling procedures for this study have been reported elsewhere (Berkman and Breslow, 1983; Hochstim, 1970).

The 1994 follow-up sample included 2,730 subjects age 46–102 who responded to the 1994 follow-up survey. The 1994 sample is used because the full array of mental health measures was only asked in this wave. Of the 2,655 eligible subjects who were age 50 or older, 90 percent ( $n = 2,417$ ) had complete data on the measure of depression and the risk factor measures and were included in the analyses reported here. The mean age was 64.9 (range 50–97). There were 195 African Americans (8.1%), 95 Asian Americans (3.9%), 92 Hispanics (3.8%), and 34 American Indians (1.4%) in the sample. Males numbered 1,061 (43.9%). The excluded group ( $n = 238$ ) comprised proportionately more females ( $p = .01$ ) and more older subjects ( $p < .001$ ) than those in the other group, but was not different in terms of the percentage of African Americans ( $p = .08$ ) or prevalence of depression ( $p = .14$ ).

### Measures

The measure of clinical depression is a set of 12 items which operationalize the diagnostic symptom criteria for a major depressive episode (MDE) outlined in DSM-III-R and DSM-IV (American Psychiatric Association, 1987, 1994). The items or symptom queries were adapted from the PRIME-MD mood disorders section (Spitzer et al., 1994). The symptoms are: depressed mood, anhedonia, loss of energy, appetite or weight loss, overeating or weight gain, trouble falling or staying asleep, sleeping too much, trouble concentrating, poor self-esteem, agitation, motor retardation, and thoughts of death. The time frame is almost every day during the last two weeks. The measure can be used to estimate prevalence of MDE or can be used as a scale. Internal consistency of the latter is .80 in this sample. This measure provides an estimate of the prevalence of subjects who meet Criterion A (symptoms experienced) but not Criterion B (exclusions for bereavement, depression due to organic factors or conditions, mood incongruent delusions, or severity of depression in terms of functional impairment).

Risk factors (correlates) examined are age, gender, education, marital status, social isolation, social support, life events, financial strain, neighborhood quality, problems

with normal daily activities, and chronic medical conditions. These factors can be categorized as status attributes, psychosocial resources, and stressors (see Kaplan et al., 1987; Roberts, 1987), and are widely considered to be important determinants of risk for depression. Table 1 shows how each indicator is scored in relation to risk of

Table 1. Risk Factors and Their Distributions

Risk Factor	n	%
Age		
50–59	885	36.6
60–69	707	29.3
70–79	593	24.5
80+	232	9.6
Gender		
Male	1061	43.9
Female	1356	56.1
Marital Status		
Married	1703	70.5
Divorced/Separated/ Widowed/Never married	714	29.5
Education		
≥12 years	2033	84.1
<12 years	384	15.9
Financial Problems		
No problems	2016	83.4
Problems	401	16.6
Chronic Conditions		
None	1033	42.7
1 Condition	707	29.3
2+ Conditions	677	28.0
ADL		
No problems	2164	89.5
Problems	253	10.5
Perceived Physical Health		
Good/Excellent	1988	82.3
Fair/Poor	429	17.7
Perceived Mental Health		
Good/Excellent	2152	89.0
Fair/Poor	265	11.0
Recent Life Events		
None	939	38.8
1 event	657	27.2
2 events	441	18.2
3+ events	380	15.7
Neighborhood Problems		
No problems	1585	65.6
Some problems	476	19.7
Serious problems	356	14.7
Social Isolation		
Low (0)	1003	41.5
Medium (1–2)	757	31.3
High (3+)	657	27.2
Social Support		
High (16+)	1031	42.7
Moderate (10–15)	874	36.2
Low (0–9)	512	21.2

depression and distributions. Definitions of age, gender, education, and marital status are self-evident. "Financial problems" consists of five items that inquire how often there was not enough money: (1) to buy clothes; (2) to fill a prescription; (3) to see a doctor; (4) to pay rent or mortgage; or (5) to buy food. We asked about the occurrence of 12 chronic medical conditions (heart trouble, high blood pressure, asthma, chronic bronchitis, arthritis, emphysema, diabetes, stroke, cancer, cataracts, osteoporosis, circulatory problems) in the last 12 months. We also asked if the respondent had difficulty with the usual activities of daily living (ADLs): (1) walking across a small room; (2) bathing; (3) brushing hair or washing face; (4) eating; (5) dressing; (6) moving from bed to a chair; and (7) using the toilet. Any difficulty on any item was classified as having a problem with ADLs. Respondents were asked whether, in their opinion, their health was excellent, good, fair, or poor. They also were asked whether their emotional or mental health was excellent, good, fair, or poor. We asked subjects about whether 17 life events had occurred in the current or previous year (1993). The number of recent events were summed. Six questions were asked about how much of a problem each of the following was in the neighborhood: (1) crime; (2) traffic; (3) noise; (4) trash and litter; (5) lighting at night; and (6) public transportation. Each item is dichotomized as a very serious problem or somewhat serious problem versus a minor problem or not really a problem. The number of problems were counted and divided into no problems (0), some problems (1), and serious problems (2 or more). Our measure of isolation consists of six items: (1) how many friends can you confide in; (2) how many relatives do you feel close to; (3) how many friends and relatives do you see at least once a month; (4) how many friends and relatives can you turn to for help; (5) how many friends and relatives can you talk to about personal measures; (6) how many friends and relatives do you have whom you can ask for advice or information? A score of three or fewer on each question was considered an isolated response. The number of isolated responses are summed and coded into low (0), medium (1-2), and high social isolation (3+). Our measure of social support asks how often are the following available: (1) someone to take you to the doctor; (2) someone to prepare meals for you; (3) someone to help you with your daily chores if you are sick; (4) someone to lend you money if you need it. Each question is scored from 0 (none of the time) to 4 (all of the time) and then summed into a total scale ( $\alpha = .90$ ). The scale was divided into low, medium, and high support as indicated in Table 1.

## RESULTS

Symptom profiles are presented in Table 2 for cases and noncases, by gender. The two profiles for cases are remarkably similar. Spearman's rank-order correlation for male and female "cases" is .94 ( $p < .001$ ). Depressed mood, fatigue, and anhedonia were the three most prevalent symptoms for both genders. The next most prevalent symptom for men was "thoughts of death"; for women it was "trouble concentrating." Two gender-specific patterns are apparent. Men were more likely to report sleeping too much, having psy-

Table 2. Prevalence of Symptoms of Depression

Symptoms	Males		Females	
	% Case (n = 72)	% Noncase (n = 989)	% Case (n = 138)	% Noncase (n = 1218)
Feeling sad, blue, or depressed	91.67	8.33	92.75	7.25
Loss of interest or pleasure	83.33	16.67	76.09	23.91
Feeling tired	83.33	16.67	89.13	10.87
Appetite or weight loss	29.17	70.83	26.81	73.19
Overeating or weight gain	34.72	65.28	46.38	53.62
Trouble falling/staying asleep	59.72	40.28	64.49	35.51
Sleeping too much	31.94	68.06	25.36	74.64
Trouble concentrating	63.89	36.11	65.94	34.06
Feeling no good/worthless	61.11	38.89	56.52	43.48
Very fidgety or restless	43.06	56.94	36.96	63.04
Moved/spoke very slowly	30.56	69.44	20.29	79.71
Thoughts of death	75.00	25.00	58.70	41.30

Note: Spearman's rank order correlation between male and female cases is 0.94 ( $p < .001$ ).

chomotor retardation, and thoughts of death. Women were more likely to report overeating or weight gain. Both men and women were about twice as likely to report trouble falling or staying asleep rather than oversleeping. Other than this, there were few differences of note.

Table 3 presents prevalence data by age and 12 other risk factors using unadjusted logistic regression. In these analyses there is a trend of increased depression with increasing age. For example, those 80 and older have nearly a 60 percent higher rate of depression compared with those 50-59. However, because of the small number of those 80 and older, the odds ratio is not statistically significant. Every other factor examined constitutes a significant risk factor for depression. The most significant correlates were perceived physical health (OR = 7.47), ADL (OR = 6.30), and perceived mental health (OR = 19.48).

Table 4 presents data indicating that the apparent trend of greater depression with increasing age is not due to age effects per se. When the effects of the other risk factors are controlled using sequential multiple logistic regression analyses, there not only are no significant age effects, those 50-59 actually have somewhat higher rates than those in the older age groups. We entered the covariates in groups: Model II adds gender and marital status to age; Model III adds education and financial problems; Model IV adds chronic conditions, ADL, and perceived physical and mental health; Model V adds life events and neighborhood problems; Model VI adds social isolation and social support. As can be seen, Model IV indicates that the initial stepwise increase in depression with age is primarily the result of impairment in physical health and perceptions of health status. Adjustment for other covariates has little or no effect.

We also ran Model IV with only chronic conditions and ADL problems, excluding the two perceived health mea-

Table 3. Prevalence of Depression by Psychosocial Risk Factors, Alameda County Study, 1994

Risk Factor	% Depressed	Unadjusted Odds Ratio	p-value
Age			
50-59	8.3	ref	
60-69	6.7	0.79	.23
70-79	10.5	1.30	.15
80+	12.1	1.53	.07
Gender			
Male	6.8	ref	
Female	10.2	1.56	.004
Marital Status			
Married	7.3	ref	
Divorced/Separated/ Widowed/Never married	12.0	1.74	<.001
Education			
≥12 years	7.8	ref	
<12 years	13.3	1.81	<.001
Financial Problems			
No problems	6.6	ref	
Problems	19.5	3.45	<.001
Chronic Conditions			
None	4.9	ref	
1 Condition	7.8	1.62	.02
2+ Conditions	15.4	3.50	<.001
ADL			
No problems	6.2	ref	
Problems	29.6	6.3	<.001
Perceived Physical Health			
Good/Excellent	4.7	ref	
Fair/Poor	27.0	7.47	<.001
Perceived Mental Health			
Good/Excellent	4.1	ref	
Fair/Poor	45.7	19.48	<.001
Recent Life Events			
None	7.0	ref	
1 event	8.2	1.19	.38
2 events	9.8	1.43	.08
3+ events	12.4	1.87	.002
Neighborhood Problems			
No problems	6.4	ref	
Some problems	10.9	1.80	<.001
Serious problems	16.0	2.80	<.001
Social Isolation			
Low (0)	5.6	ref	
Medium (1-2)	7.1	1.30	.18
High (3+)	15.2	3.04	<.001
Social Support			
High (16+)	5.2	ref	
Moderate (10-15)	9.3	1.85	<.001
Low (0-9)	14.7	3.11	<.001

sures. Our reasoning was that the perceived mental health and the depression measures, in particular, share considerable variance. The results changed little (data not shown). The odds ratio were .72 for those 60-69, .88 for those

Table 4. Crude and Adjusted Odds Ratios for Age and Depression, 1994 Alameda County Follow-up Survey

Model	Age		
	60-69	70-79	80+
I. Crude (Unadjusted)	0.79 (0.23)	1.30 (0.15)	1.53 (0.07)
II. Model I + Gender/Marital Status	0.80 (0.24)	1.29 (0.16)	1.35 (0.21)
III. Model II + Education/Financial Problems	0.86 (0.45)	1.49 (0.04)	1.59 (0.07)
IV. Model III + Chronic Conditions/ADL/Perceived Physical and Mental Health	0.72 (0.16)	1.00 (0.99)	0.76 (0.38)
V. Model IV + Life Events/Neighborhood Problems	0.74 (0.20)	1.03 (0.90)	0.85 (0.60)
VI. Model V + Social Isolation/Social Support	0.77 (0.26)	0.99 (0.98)	0.85 (0.62)

Note: Odds ratios are presented above and p-values below in parentheses. The reference group for all contrasts is the group aged 50-59.

70-79, and .78 for those 80 and older. None were statistically significant ( $p > .10$ ).

#### DISCUSSION

We found a trend for increased risk for depression with age: the odds ratio was 1.53 for those 80 and older compared to those 50-59 when no adjustments were made for covariates. However, given the small number of those over 80, the trend was not significant ( $p = .07$ ). We also found that adjusting for the effects of all other risk factors eliminated the age trend. Examination of the effects of these other risk factors showed that the putative age effect could be almost completely attributed to the joint effects of chronic medical conditions, disability, and perceptions of well-being on depression.

Our findings with regard to risk factors other than age have been reported by many others for both older samples and general community samples (for example, see Blazer et al., 1991; Jorm, 1995; Lewinsohn et al., 1991). Women, the less educated, the unmarried, those with health and disability problems, those with financial problems, those with more negative life events, and those with less social support and who are more isolated all are at increased risk of major depression. These results are the same as those we reported in an earlier analysis of the 1965 and 1974 Alameda County surveys, using a different measure of depression (Kaplan et al., 1987).

Overall, 6.6 percent of the men aged 50 and older and 10.1 percent of the women met DSM symptom criteria for a major depression episode in the past two weeks. The prevalence was 12 percent for those 80 years of age and older. Data presented in Henderson et al. (1993) for seven studies using DSM criteria for major depression among the elderly range from a low of 0.7 percent to a high of 15.5 percent. The latter (Kay et al., 1985) was for those 80 and older. With the exception of that study, none of the other six studies reported prevalences above 2 percent. Gurling et al. (1995b) report that the prevalence of DSM-III-R major depression in an English sample ≥ 77 years was 2.4 percent.

Skoog et al. (1993) report the prevalence of DSM-III-R major depression in a Swedish sample of 85-year-olds was 7.7 percent. Kivela, Pakkala, and Laippala (1988) report rates of DSM-III major depression of 2.6 percent for males and 4.5 percent for females in a Finnish sample 60 years and older.

Thus, our rates are similar to those reported by Kay and colleagues (1985), but considerably higher than those from most studies. Are the higher rates for the Alameda County cohort real? The answer is yes and no.

The answer is yes, in that rates presented are the point prevalences of *symptoms* of DSM-III-R or DSM-IV major depressive episodes in the Alameda County cohort. But, the rates do not reflect the prevalence of *diagnoses* of DSM major depressive episodes. Our measure includes all of the symptoms of a major depressive episode as well as the duration criterion (past 2 weeks, almost every day; American Psychiatric Association, 1994). However, the data are based on self-report, and we were not able to ascertain whether the depression was the result of drugs or organic disease or whether the depression was due to bereavement. However, recent research on the efficacy of bereavement as an exclusionary criterion suggests that the concept is of little help in clarifying the course and significance of depressive episodes subsequent to widowhood, or in defining the boundaries of major depression (Zisook and Shuchter, 1993). Since our data are based on self-report, we also were not able to exclude symptoms of depression due to a mixed episode, the presence of physiological effects due to drugs or a general medical condition or bereavement, nor were we able to determine whether symptoms caused clinically significant distress or impairment (American Psychiatric Association, 1994). We also had no independent assessment of cognitive impairment and so could not ascertain how cognitive difficulties might affect prevalence. We assume this effect to be minimal because, with few exceptions, our questionnaires are self-administered. Therefore, our prevalence rates are higher than would be the case if clinical diagnoses had been made on the basis of structured psychiatric interviews using appropriate probes for exclusions.

As has been noted elsewhere (Roberts, 1987), there is general consensus that the two different measurement strategies assess somewhat different domains of depressive experience.

Newmann (1989) has found that studies using symptom scales, in general, yield a negative linear and a positive curvilinear trend, with highest depression scores among the youngest and oldest age cohorts. By contrast, studies using clinical diagnoses yield the opposite relationship: a positive linear and a negative curvilinear trend. Newmann's findings provide strong corroboration for the conclusions of Blazer (1982), who earlier reported low prevalence of major depressive disorder but high prevalence of depressive symptoms among older persons.

Concerning the disparate age-depression patterns observed using symptom counts versus clinical diagnoses, Newmann (1989) suggested two possible hypotheses. The first is that the two approaches measure distinctly different depressive phenomena with distinctive age distributions. The second hypothesis is that both measurement ap-

proaches have age-related errors that bias estimates of depression among older persons in different ways. Newmann argued that symptom scales may overestimate depression among older persons because they do not permit control for other, more delimited forms of distress which inflate their depression scores. Conversely, clinical diagnoses may underestimate depression among older persons because inclusionary and exclusionary diagnostic criteria assessing severity omit significant proportions of older populations. Although we think the hypotheses about screening scales and age may be tenable, we would argue that the clinical diagnosis bias argument is almost certainly true and has been noted by others (see, for example, Burvill, 1987; Kermis, 1986; Snowdon, 1990). Thus, use of more inclusive DSM symptom criteria should result in higher prevalence rates, and that is exactly what we find.

Recent research by Knäuper and Wittchen (1994) suggests that lower prevalence of clinical depression using structured instruments such as the DIS is in part a function of a heuristic strategy in which individuals attribute depressive experiences to physical illness to simplify complex answering processes when they have insufficient memory capacity to cope with them. This is particularly true of older subjects who, presented with conditional or branching probes, often respond negatively to stem queries about symptoms of depression. Hasin and Link (1988) also report that older persons are less likely to recognize and label symptoms of major depression as a psychological or emotional problem than are younger persons. Merikangas, Prusoff, and Weissman (1984) report that older persons also are less likely to report episodes of major depression in their relatives. Thus, it seems that older persons generally are less likely to endorse queries about depression.

Our data on DSM symptoms of major depression lead us to conclude that, among those 50 years of age and older, increasing age is not associated with increased depression. The results also suggest that apparent age-related effects on depression are the result of other risk factors, particularly physical health problems and related disability. Our results corroborate those of other researchers who find that age *per se* is not a risk factor for depression, net of the effects of other risk factors (see Berkman et al., 1986; Blazer et al., 1991; Kennedy et al., 1989; O'Hara, Kohout, and Wallace, 1985). In a particularly insightful article, Lewinsohn and his colleagues (1991) report that the correlates of depression were not part of the aging pattern. The aging pattern was defined primarily by negative changes in psychophysiological and neuropsychological functioning; these changes in turn were not associated with depression. The implications seem clear: healthy, normal-functioning, older adults are at no greater risk of depression than younger adults. This is a conclusion based upon epidemiologic evidence. That is, age does not appear to be a direct cause of depression, net of the contributions of other putative risk factors. This is not to argue that the point prevalence of depression does not increase with age. On the contrary, there is abundant evidence for increased depression as adults grow older (see Blazer, 1982; Jorm, 1995; Snowdon, 1990), including an age trend in the data presented here.

Another conclusion suggested by our results, from a pub-

lic health perspective, is that the risk factor profiles for depression in this sample of adults 50 and older are comparable to those of younger adults, and even adolescents (Lewinsohn et al., 1994). By this, we mean that the same factors (e.g., lower socioeconomic status, greater life stress, lack of social support, physical health problems, etc.) appear to be operant. Of course, the importance of these factors relative to each other may vary across the age span. A case in point is the role of physical health. One implication is that factors increasing risk of depression over the life span are rather stable in terms of the domains represented. A further implication is that, as a result, generalized intervention strategies that target common risk factors across the life span may be possible. For example, if physical health, disability, and social isolation account for higher depression among older persons, then modification of these factors could lower rates of depression. Rowe and Kahn (1987) have argued just this point, noting that such risk factors can be modified by diet, exercise, change in personal health habits, and by improving the social support and financial resources of older adults. Such prevention efforts could be either *universal*, targeting everyone by reducing age-related risk factors for depression, or *selective*, targeted to older persons at greater risk for such age-related changes increasing the chance for depression (see Mrazek and Haggerty, 1994, pp. 19–29).

Finally, we would like to note again that our data consist of depressive symptoms rather than depressive diagnoses. Recent findings (Blazer et al., 1988) suggest that diverse depressive syndromes occur in community populations and that the epidemiologic dimensions of these syndromes also may differ. Research is needed to investigate the relation between these diverse depressive syndromes and how risk and protective factors are related to their etiology and natural history across the life span.

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Address correspondence to Dr. Robert E. Roberts, The University of Texas School of Public Health, P.O. Box 20186, Houston, TX 77225. E-mail: rerober@utsph.sph.uth.tmc.edu

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