Age and Depression*

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In this study, the relationship between age and depression is analyzed, looking for effects of maturity, decline, life-cycle stage, survival, and historical trend. The data are from a 1990 sample of 2,031 U.S. adults and a 1985 sample of 809 Illinois adults. The results show that depression reaches its lowest level in the middle aged, at about age 45. The fall of depression in early adulthood and rise in late life mostly reflects life-cycle gains and losses in marriage, employment, and economic well-being. Depression reaches its highest level in adults 80 years old or older, because physical dysfunction and low personal control add to personal and status losses. Malaise from poor health does not create a spurious rise of measured depression in late adulthood. However, some of the differences among age groups in depression reflect higher education in younger generations, and some reflect different rates of survival across demographic groups that also vary in their levels of depression.

AGE AND DEPRESSION

Is being older depressing? The answer proposed depends on one's concept of age. The simple physical measure of elapsed time since birth is not simple in its human implications: maturity, decline, life-cycle stage, survival, and historical trend.

The question of depression's relationship to age divides into several parts. First, what is the pattern of depression by age? Depression may fall with increasing maturity, rise with accumulating erosion of function and powers, or fall and rise in reflection of the gains and losses of life's cycle. Second, do coincident, coexistent, or concurrent differences among age groups create the spurious appearance that aging depresses people? Depression may appear to increase with age because organic decline produces physiological effects similar to those of depression, because women suffer greater depression than men but live longer, or because formal education reduces depression throughout the lifetime and was less available to older generations. Third, to what extent do age-dependent statuses explain the pattern of depression by age? Changes in marital, employment, and economic status constitute the social life-cycle. Some cyclical statuses may comfort and others depress, producing life-cycle patterns of depression. Fourth, to what extent do age differences in physical ability and perceived control of one's own life and destiny explain the pattern of depression by age? As function and opportunity fade, self-assurance and hope may vanish with them.

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Five Views of Age

Despite its apparent simplicity as a measure, age is a complex human trait (Riley 1987). Maturity, decline, life-cycle, survival, and historical trend suggest different, and

sometimes opposite, predictions about depression that are *not mutually exclusive*. Separating the amalgam into its theoretical elements suggests ways to distinguish the elements blended in the age pattern of depression. The remainder of this introduction summarizes the theoretical and empirical basis for each view of age, and the pattern of depression it implies. Then it analyzes the previous research on age and depression. Taken together, the theory and prior research suggest a number of hypotheses embodied in the model and analysis that follows.

Age as Maturity

Age implies the summation of growth and development. With age, people become experienced, accomplished, and seasoned. They mature. Self-integration requires time. Each human sums a lifetime of experience, composing a self of elements arranged to function efficiently and successfully. Aging increases practice with living, and the extent of self composition. With growing insight and skill, social and psychological traits and tendencies merge into an increasingly harmonious whole. In *Childhood and Society,* Erik Erikson describes maturity as "the resting place between the extremes" (Erikson 1963, p. 190). Immature thought and action oscillate between self-indulgent, organic drives and the counterbalancing social reaction and personal remorse. Through experience, individuals learn to dampen the oscillations, keeping thought and action within comfortable and effective limits.

Several age trends suggest that maturity comes with age: lower crime rates, safer habits, a more orderly lifestyle, greater satisfaction, and a more positive self-image. Both the official and self-reported rates of crime decline steeply in early adulthood, and continue to decline throughout subsequent ages (Hirschi and Gottfredson 1983; Ross and Mirowsky 1987). People in older age groups lead a more routine and orderly life, take fewer risks, avoid fights and arguments, drink more moderately and carefully, and refrain from the recreational use of illegal drugs (Umberson 1987). Workers in successively older age groups report greater satisfaction with their jobs, beyond that due to the higher rank and pay that comes with age (Kalleberg and Loscocco 1983). People in successively older age groups rate themselves more helpful, supportive, disciplined, able, and satisfied with life, and less emotional, nervous, and frustrated; they report greater self-esteem and, until age 75, less of a sense that life is empty and meaningless (Campbell, Convers and Rodgers 1976; Gove, Ortega and Style 1989).

The signs of maturity and integrity associated with age suggest a parallel decline in depression. The decline in criminal tendencies accompanies a decline in normless and antisocial attitudes that produce fear, anxiety and bitterness (Dohrenwend and Dohrenwend 1969; Mirowsky and Ross 1989). Increased self-esteem lowers depression (Pearlin et al. 1981). Greater satisfaction and a more positive self-image also may reduce depression, or may reflect the same personal development that reduces depression.

Thus, the *maturity hypothesis* says that average levels of depression decrease in successively older age groups.

Age as Decline

As humans sum and integrate experience, they also sum and integrate failures, faults, injuries, and errors. In the biological realm, the slow and steady accumulation produces little apparent effect at first. Like the wrinkling of skin or the graying of hair, the deterioration may proceed at a rate below noticeable. But eventually the *accumulation* becomes apparent. Many cumulative physical problems compound. For example, weight gained in body fat reduces physical activity, and lower physical activity increases the rate of weight gain. Insidiously compounding decline may occur in the emotional realm as well, as a consequence of physiological decline or as an independent process.

Several research findings show physiological decline with advancing age: increasing rates of disease and dysfunction, declining activity and peak performance, and increasing problems with memory, attention, and other cognitive functions. Average levels of physical and mental functions are relatively stable throughout most of the adult years, but erode at an slowly accelerating rate to produce substantial average decrements beyond age 70 (Schaie 1983). The incidence and prevalence of chronic disease increase at an accelerating rate with age (Collins 1988; Hartunian,

Smart, and Thompson 1981). The average level of dysfunction also accelerates, including trouble seeing, hearing, walking, lifting, climbing stairs, grasping, and manipulating (Waldron 1983; Waldron and Jacobs 1988), with related declines in performance of daily activities such as shopping, cooking, cleaning, gardening, bathing, grooming, dressing, and eating (Berkman and Breslow 1983; Guralnik and Kaplan 1989). The peak performance of athletes and the typical levels of physical activity among non-athletes both decline (Shephard 1987), as does carbohydrate metabolism (the process that fuels the muscles), lung capacity, and bone density (Rowe and Kahn 1987). Cognitive function also declines, including orientation to time and space, recall, attention, simple calculation, language comprehension, and the speed of perceptual, motor, and cognitive processes (Holzer et al. 1986; House and Robins 1983; Rowe and Kahn 1987; Schaie 1983).

An accelerating decrease in the average sense of control over personal outcomes parallels the physical and mental decline (Mirowsky and Ross 1990). Indeed, poor physical health and low perceived control appear linked in a deviation-amplifying feedback loop that could account for the acceleration of decline in both factors with advancing age (Rodin 1986). Poor health, chronic disease, physical and mental dysfunction, and restricted activity erode the sense of controlling one's own life and destiny (Baltes, Wahl, and Schmid-Frustoss 1990; Lachman 1986). A low sense of control over the events and outcomes in one's own life fosters inattention, detachment, disengagement, inactivity, indifference, apathy, and neglect. The lack of practice degrades physical, mental, and social function (Rodin 1988; Rowe and Kahn 1987).

Emotional well-being may decline along with fitness, health, and function. Physiological symptoms typically coincide with emotional distress. Confusion, forgetfulness, trouble concentrating, losing one's train of thought, heart palpitations, dizziness, cold sweats, hot flashes, breathlessness, muscle spasms and loss of appetite often accompany feeling sad, blue, moody, hopeless, or suicidal (Mirowsky and Ross 1989). The same physiological systems implicated in depression take part in the body's response to microorganisms, toxins, injuries, physical extremes, and threats (Carroll et al. 1981; Gold, Goodwin, and Chrousos 1988; Selye 1976). Disease and poor health increase current and subsequent depression (Aneshensel, Frerichs, and Huba 1984; Kennedy et al. 1989). Emotional well-being declines with lower levels of exercise and physical health (Hayes and Ross 1986). Among the elderly, depression correlates strongly with limitations such as difficulty preparing meals, shopping, getting out, laundering clothes, and bathing, with ambulatory problems such as difficulty walking or climbing stairs, and with dependence on others for performing daily activities (Gurland et al. 1988; Kennedy et al. 1989). A low or declining sense of control over one's own life increases depression (Benassi, Sweeney, and Defour 1988; Pearlin et al. 1981; Wheaton 1980).

The *decline hypothesis* says that average levels of depression increase at an accelerating rate in successively older age groups. Adjusting for physical function and sense of control eliminates some of the rise in depression associated with age.

Age as Stage

Age implies a stage or phase in life's cycle. Human life progresses through common sequences of roles: from school to job to retirement, from single to married to widowed (Hogan 1978). Over the lifetime, adult status and prospects rise and fall. The phased roles interlock with a flow and ebb of freedoms, prerogatives, privileges, options, opportunities, scope, and resources. The achievements and acquisitions of early adulthood build the rank and prosperity of middle age, which eventually erodes in the retrenchment and loss of old age.

Changes in marital, job, and economic status index the social life-cycle. Most Americans begin their 18th year single, in school or recently graduated, and with little wealth or personal earnings. The progression to middle age increases the percentage married, percentage employed, average earnings of the employed, and the average family income (Mirowsky and Ross 1989). Beginning around age 60, the progression into old age sharply increases the percentage retired and widowed, and decreases average earnings and total family income.

The progression of marital, job, and economic status may drive a mirror-image fall and rise in depression. Marriage, employ-

ment, earnings, and family income all reduce depression (Essex and Nam 1987; Gore and Mangione 1983; Gove and Geerken 1977; Gove, Hughes and Style 1983; Kasl, Gore, and Cobb 1975; Kessler and Essex 1982; Kessler, House, and Turner 1987; Linn, Sandifer, and Stein 1985; Pearlin et al. 1981; Ross and Huber 1985). Taken together, marital, job, and economic status account for a large part of the variation in depression predictable from sociodemographics. They may largely determine the pattern of association between age and depression.

The *life-cycle hypothesis* says that average levels of depression decline from early adulthood to middle age and then rise subsequently. Adjusting for marital status, employment, earnings, and income eliminates some of the decline and then rise in depression associated with age.

Age as Survival

Age indirectly indexes traits associated with differences in survival. Traits that confer a selective advantage become more common with age, while those that confer a selective disadvantage become scarce. Being older increases the likelihood of having the traits associated with survival. Those traits may create a false impression of *aging's* effect, making it appear beneficial or benign when it is actually destructive. If only the strong survive, it may seem, falsely, that aging increases strength. Because of differential survival, the correlation of a trait with age can obscure or contradict the effect of *aging*.

Depression and other forms of psychological distress reduce survival. Two follow-up studies find that the severely depressed die at a rate significantly higher than others—2 to 4 times higher *adjusting for* age, sex, socioeconomic status, preexisting chronic health problems (hypertension, heart disease, stroke, cancer) and fitness (blood pressure, blood cholesterol, lung capacity, overweight, smoking) (Bruce and Leaf 1989; Somervell et al. 1989). A small part of excess mortality among the depressed is due to suicide, which has its highest rates among the elderly (NCHS 1990), but most is due to other causes (Bruce and Leaf 1989).

Many of the same statuses and conditions that produce depression also reduce survival. Both depression and mortality rates are elevated among minorities, people who are not employed, people whose education and income are low, and people who are not married. Among minorities, average levels of depression tend to be higher and the life expectancy at birth is 4.4 years lower (6.4 years lower for Blacks) (Kessler and Neighbors 1986; Mirowsky and Ross 1990; NCHS 1990). Employment, education, and income decrease the average levels of depression (Gove and Geerken 1977; Holzer et al. 1986; Mirowsky and Ross 1989; Pearlin et al. 1981), *and* decrease age-specific rates of mortality (Antonovsky 1967; Berkman and Breslow 1983; Comstock and Tonascia 1977; Kitagawa and Hauser 1973; Kotler and Wingard 1989; Leigh 1983; Sagan 1987). Married people are less depressed than others (Gove et al. 1983; Kessler and Essex 1982; Mirowsky and Ross 1989) *and* age-specific mortality rates are 30 percent to 60 percent lower for married persons than for the single, divorced, separated, or widowed (Berkman and Breslow 1983; Kotler and Wingard 1989; Litwak and Messeri 1989). In particular, the widowed have higher death rates from coronary heart disease, stroke, pneumonia, many kinds of cancer, cirrhosis of the liver, automobile accidents, and suicide, all of which are leading causes of death (Bowling 1987; Kaprio, Koskenvuo, and Rita 1987). Lower survival among the most depressed groups can make *aging* seem less depressing than it is.

Although most social traits associated with depression reduce survival rates, there is one major exception: being female. Women are more depressed than men, but they live an average of 6.8 years longer (Aneshensel, Frerichs, and Clark 1981; Gove 1984; Radloff 1975; NCHS 1990; Waldron 1983). Average life expectancy at birth is 78.3 years for females compared to 71.5 years for males. To the extent that females are more depressed and live longer, aging appears *more* depressing than it really is, which tends to counteract the other survival effects described above.

The *survival hypothesis* has two forms. In the first, average levels of depression decrease in progressively older age groups, and adjusting for marriage and socioeconomic status explains some of the falling curve. In the second, depression increases in progressively older groups, and adjusting for sex

explains some of the rising curve. Although these contradictory survival trends could cancel, they also could explain part of a U-shaped association between depression and age.

Age as Historical Trend

Age marks the place of one's cohort in the major trends of recent history. At any given stage in their lives, the members of younger generations benefit from material, economic, and cultural progress. In the United States, twentieth-century trends increased average education, income, female employment, and life expectancy, and decreased family size and rural residence (Bianchi and Spain 1986; Sagan 1987). In the past 50 years alone, median family income (adjusted for inflation) more than doubled, life expectancy at birth increased 20 percent, age-adjusted annual mortality rates dropped 60 percent, the proportion living in rural areas dropped from 45 percent to 25 percent, total fertility rates dropped 20 percent, and the proportion of women in the labor force more than doubled, from 25 percent to over 50 percent (Bianchi and Spain 1986; Hoffman 1991; Sagan 1987). Fifty years ago, 6 percent of Americans aged 25 through 29 had less than five years of formal education, and only 6 percent had completed four years of college (Hoffman 1991). Today, under 1 percent has less than five years of education, and 25 percent have four years of college. In 1900, one American in 10 could not read. In 1940 it was one in 25. Today it is less than one in 100.

Of the factors involved in major trends, education is most central to well-being. Education decreases average levels of depression directly, as well as by increasing the probabilities of employment and marriage, by increasing average earnings, job autonomy, and family income, and by improving household economy and marital relations (Ross and Huber 1985; Ross, Mirowsky, and Huber 1983). Aggregate increases in education seem to have generated the trends in income, life expectancy, family size, and female employment (Sagan 1987). Increasing education in younger generations implies lower average depression in younger age groups.

The *historical trend hypothesis* says that average levels of depression are higher in older groups, and that adjustment for education explains some of the positive association.

Previous Studies

Previous studies do not completely describe and dissect the relationship between age and depression in adulthood. Previous studies of age and depression either do not compare adults of different ages, do not compare the full range of adult ages, do not consider the possibility of a non-linear association, exclude much of the sadness and malaise reported by the elderly, or do not distinguish and compare total association, total effect, and net effect.

Many studies look at the problems that create or worsen depression among older adults, or among younger adults, but do not compare average levels of depression across age groups (e.g., Kaplan, Robbins, and Martin 1983; Kraus 1986). Such studies provide information about the problems faced by people of a particular age, but they provide no information about the effect of age itself.

Among the studies that compare adults of different ages, some only look at adults of reproductive and employment age, and others only look at adults of retirement age. A meta-analysis of research reports shows that depression *de*creases with age in surveys of young and middle-aged adults, but *in*creases with age in surveys of older adults (Newmann 1989). A composite view suggests that average depression declines in young adulthood, bottoms out in middle age, and rises again in the retirement years.

A parabolic association between age and depression could explain why crude comparisons of depression among the elderly to that among young and/or middle-aged adults produce contradictory or equivocal results. A review of 27 research reports comparing retirement-age adults to others found that eight reported the other adults more distressed, six reported the older adults more distressed, and 13 reported no difference or mixed results (Feinson 1985a, b). The inconsistencies lead Feinson (1985a, b) to call depression in old age a "scientific myth." An alternative possibility is that the comparison group varied across studies. If depression drops and then rises with age, the results from comparing older adults to others will depend

on how many of the others are young and how many are middle-aged.

The late-life increases in depression typically do not appear in studies that count only psychiatric diagnoses of major clinical depression (Newmann 1989). However, the odds of qualifying for the diagnosis are not the same thing as levels of depression. Sadness and malaise are necessary, but not sufficient, to qualify for the diagnosis. Current psychiatric philosophy views "clinical" depression as essentially endogenous—springing from the organism rather than from its environment and history (Newmann 1989, p. 160). Apparently, current psychiatric diagnosis of major clinical depression rules out much sadness and malaise attributable to disease, grief, poverty, restricted activity, and physical disability (Boyd et al. 1982; Kennedy et al. 1989). At any given level of depressed mood and vigor, the likelihood of qualifying for a psychiatric diagnosis of depression goes down with age (Mirowsky and Ross 1982). The rules for diagnosing major clinical depression empirically rule out much of the sadness and malaise found among the elderly (Newmann 1989). The low or declining odds of qualifying for a psychiatric diagnosis of major clinical depression among older age groups does not necessarily imply low or declining average levels of depression.

One final reason that studies of age and depression may *appear* to find contradictory or null results is that they adjust for varying combinations of the factors which account for age patterns of depression. The total association between age and depression may blend historical trends, survival traits, and status trajectories with counterpoised maturity and decline. The meaning of results depends on the adjusted covariates, their place in a causal hierarchy, and their theoretical and empirical links to the five views of age. For example, one study of adults ages 18 through 92 reports that age decreases depression (Aneshensel, Frerichs, and Huba 1984). The effect adjusts for education (historical trend), sex (survival trait), income and occupational status (status trajectories), and simultaneous or pre-existing illness (physiological decline). Because of the adjustments, it would be false to infer that depression declines progressively throughout the lifetime. The net negative coefficient probably represents the residual effect of maturity after removing the effects of status trajectories and physiological decline. It represents one aspect of age and aging, but not others.

Ideally, analyses should present at least three maps of depression by age: (1) the *total association,* which does not adjust for any covariate; (2) the *total effect,* which only adjusts for ascribed statuses (e.g., female, minority) and things that stabilize early and change little subsequently (e.g., education); and (3) *direct effects,* which additionally adjust for specific things that change over the lifetime (e.g., marriage, employment, earnings, income, health). It is evident but worth noting that the interpretation of a direct effect depends entirely on the factors that have been adjusted. The hidden anatomy of age and depression is revealed in the *changes* as specific factors are adjusted.

METHODS

Sample

The data come from two telephone surveys of English-speaking adults. The 1990 *U.S. Survey of Work, Family, and Well-Being* used random-digit dialing to select households (Waksberg 1978). (Random-digit dialing ensures the inclusion of unlisted numbers.) Within each household, the person 18 years old or older with the most recent birthday was selected as respondent. (This method randomly selects a respondent from each household [O'Rourke and Blair 1983]). The response rate of 82.3 percent yields a total of 2,031 respondents, ranging in age from 18 to 90. The 1985 *Illinois Survey of Well-Being* used random-digit dialing in Chicago and its suburbs, and systematic random selection of numbers from current telephone directories in all other areas of Illinois. (The percentage of unpublished phone numbers outside the Chicago Metropolitan Statistical Area is small enough that random digit dialing is not necessary.) The response rate of 73 percent yields a total of 809 respondents, ranging in age from 18 to 85.

Variables

The two surveys asked many of the same questions in the same format. The descriptions below apply to both surveys. Two

variables appear in the U.S. data but not the Illinois data: economic hardship and physical dysfunction.

Depression is measured with a short form of the Center for Epidemiological Studies' Depression Scale (CES-D) (Radloff 1977; Ross and Mirowsky 1984). Respondents were asked, "How many days during the past week (0–7) have you (1) . . . felt you just couldn't get going? (2) . . . felt sad? (3) . . . had trouble getting to sleep or staying asleep? (4) . . . felt that everything was an effort? (5) . . . felt lonely? (6) . . . felt you couldn't shake the blues? (7) . . . had trouble keeping your mind on what you were doing?" Responses are averaged to produce an index of depression scored 0 to 7. The score indicates the number of days per week a person averages per symptom. The modified index correlates .92 with the full CES-D. The alpha reliability is .83 in the U.S. data and .76 in the Illinois data.

In order to assess the possible impact of physiogenic bias, three other measures are composed from the depression items. *Malaise* is the average response to items 1, 3, 4, and 7. Alpha reliability of the malaise index is .76 in the U.S. data and .61 in the Illinois data. *Depressed mood* is the average response to items 2, 5, and 6. Alpha reliability of the depressed-mood index is .83 in the U.S. data and .81 in the Illinois data. *Excess malaise* is the malaise score minus the depressed mood score.

Age is represented by two functions. The *falling* component equals $\ln(\text{Age} - 17)$. The *rising* component equals $(\text{Age} - 18)^3$. The reasons for the functions are explained in the following sections on the model and results.

Fixed Attributes do not change within a person's lifetime. However, fixed attributes may vary across age groups because of differential survival or historical trends. Two fixed attributes are ascribed traits related to survival. *Female* is a dummy variable that equals 1 for females and 0 for males. *Minority* is coded 1 for respondents who say they are Black, Hispanic, Native American, or Asian and 0 for others. Years of formal *education*, which reflect a major historical trend, also can be treated as a fixed attribute. Although some young adults have not completed their education, almost everyone over 30 has. Once acquired, years of education are not lost.

Changing Attributes evolve over the adult lifetime. The changes may be part of the effects of maturity, decline, or life-cycle stage that link aging to depression.

Employment, marital, and economic statuses represent the adult life-cycle. *Employment* status is indicated by five dummy variables contrasting those in school, employed part-time, unemployed, housekeeping, and retired with those who are full-time employees. *Marital* status is indicated by three dummy variables contrasting the single, divorced or separated, and widowed with those who are married.

Economic status is indicated by personal earnings, other household income, and recent economic hardship. Personal earnings are the respondent's total wages, tips, and salary of the previous 12 months. Other household income is the household total from all sources other than (minus) personal earnings. Personal earnings and other household income are measured in thousands of dollars (1990 and 1985 dollars in the U.S. and Illinois data, respectively).

Responses to three questions indicate recent economic hardship (Pearlin et al. 1981; Ross and Huber 1985): "During the past 12 months, how often did it happen that you (1) . . . did not have enough money to pay for medical care? (2) . . . did not have enough money to buy food, clothes, or other things your household needed? (3) . . . had trouble paying the bills?" The response categories are "never," "not very often," and "very often," coded 0 through 3. Alpha reliability is .82 in the U.S. data. (The questions about economic hardship were not asked in the Illinois survey.)

Two measures indicate capacities and limitations that may change over the lifetime: the sense of control over outcomes in one's own life, and physical dysfunctions that limit action or interaction.

The *control* index asks respondents if they agree or disagree with each of the following statements: (1) "I am responsible for my own successes," (2) "I can do just about anything I really set my mind to," (3) "My misfortunes are the result of mistakes I have made," (4) "I am responsible for my failures," (5) "The really good things that happen to me are mostly luck," (6) "There's no sense planning a lot—if something good is going to happen it will," (7) "Most of my problems are due to bad breaks," (8) "I have little control over the bad things that happen to me." Responses to

questions 1 through 4 are coded strongly disagree (-2), disagree (-1), neutral (0), agree (1), strongly agree (2), and responses to questions 5 through 8 are coded strongly disagree (2), disagree (1), neutral (0), agree (-1), strongly agree (-2). The control index averages the eight response scores. Balancing the number of statements claiming control and the number denying it cancels the agreement bias associated with old age and low education (Mirowsky and Ross 1991, p. 140, figure 3). Alpha reliability is .60 in the U.S. data and .68 in the Illinois data (Mirowsky and Ross 1991). (Canceling agreement bias somewhat reduces the reliability of a control measure by eliminating spurious but reproducible variance.)

The *dysfunction* index asks respondents, "How much difficulty do you have (1) . . . going up and down stairs? (2) . . . kneeling or stooping? (3) . . . lifting or carrying objects less than 10 pounds, like a bag of groceries? (4) . . . using your hands or fingers? (5) . . . seeing, even with glasses? (6) . . . hearing? (7) . . . walking?" The items come from a slightly longer set used by Waldron and Jacobs (1988). The response categories are "no difficulty," "some difficulty," and "a great deal of difficulty," coded 0, 1, and 2, respectively. The alpha reliability is .80 in the U.S. data. The questions about physical dysfunction were not asked in the Illinois survey.

Model

The model separates the association between depression and age into two component age curves, which are part of Equation 1 below.

$$\hat{D} = b_0 + b_1 \ln(\text{Age} - 17) + b_2(\text{Age} - 18)^3 + \sum_{b_i=3}^{k} (X_i - \bar{X}_i) \qquad (1)$$

The *falling* curve represents the subsiding of depression in successively older age groups that may result from maturity, rising social status, or greater survival of emotionally healthy adults. The specification of the falling curve parallels the falling prevalence of criminal and anti-social behavior in adulthood, as discussed in the introduction under the maturity hypothesis. Logging the years of adulthood produces a "linearizable" curve with the desired age profile (Daniel and Wood 1971; Stolzenberg 1980):

$$D_f = b_0 + b_1 \ln(\text{Age} - 17) \qquad (1a)$$

The intercept b_0 represents the predicted depression at age 18, when the log of (Age -17) is zero. The derivative of the falling logarithmic curve is $b_1/(\text{Age} - 17)$, so the downward slope is steepest at age 18 (when it equals b_1), and gets shallower thereafter, as age increases (Stolzenberg 1980). Thus, the falling curve starts out high and subsides with increasing age (assuming the intercept is positive and the regression coefficient is negative).

The *rising* curve represents the growth of depression in successively older age groups that may result from declining health, fitness, and function, from the loss of jobs, partners, and income, from lower education among older generations, or from the greater survival and depression of women compared to men. The specification of the rising curve parallels the gradually accelerating prevalence of dysfunction and disease, discussed in the introduction under the decline hypothesis. Cubing the years since age 18 produces a "linearizable" curve with the desired age profile (Daniel and Wood 1971; Stolzenberg 1980):

$$D_r = b_2(\text{Age} - 18)^3 \qquad (1b)$$

The cubic function *and* its slope are zero at age 18, when (Age -18) is zero. The derivative of the rising cubic curve is $3b_2(\text{Age} - 18)^2$, so the upward slope gets steeper with advancing age (Stolzenberg 1980). Thus, the rising curve starts low and flat, but rises at an accelerating rate with increasing age (assuming the regression coefficient is positive).

The third component of the model represents adjustments for fixed and changing attributes. Each attribute is measured as a deviation from the sample mean, so the intercept b_0 represents the prediction at age 18 if the control variables equal their sample means (deviations of 0 from the respective means). (For dummy variables, the mean equals the proportion of the sample with the categorical attribute.)[1]

The model is estimated in seven steps, beginning with (1) no adjustment, then progressively adding adjustments for (2) sex,

(3) minority status, (4) education, (5) employment and marital status, (6) economic status, and (7) physical dysfunction and the sense of control.

RESULTS

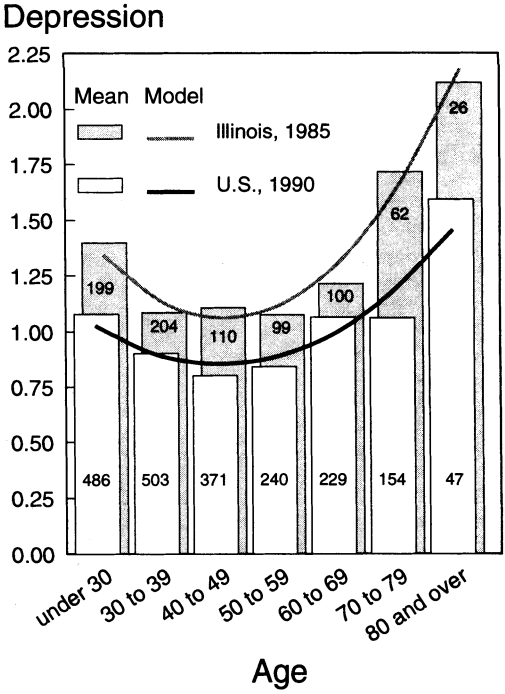
The results are organized into five main sections. The first describes the total association between age and depression. It shows the age-category means, the fitted bivariate curve, and the falling and rising components of the curve. The second looks at the total effect of age by adjusting for factors that might influence both survival and depression enough to account for some part of the total association (Davis 1985). The third looks at how much of the rising curve is attributable to lower average education in older age groups. The fourth analyzes other direct and indirect effects of age, looking for components that may be attributable to maturity, decline, and life-cycle stage. The fifth and final section explores the possibility that physical health problems bias the results by producing malaise that does not reflect depression.

Total Association

The total association shows that depression falls and then rises in successive age groups. The bars in Figure 1 show the mean depression of each age group. Average depression is lowest among the 30- to 59-year-olds in both the U.S. and Illinois data. Depression is somewhat higher in the age groups immediately above and below the broad middle-aged range. It is quite a bit higher in the oldest age groups. In all age groups, the more recent U.S. sample reports lower levels of symptoms. However, both surveys show the same general pattern of age-group differences, with the oldest group reporting twice the symptoms of the middle aged.

The regressions of depression on age fit curves that reflect the same underlying patterns as the means. The regression equations are given in column 1 (rows 1–3) of Table 1 (U.S.) and Table 2 (Illinois). In Figure 1, the smooth curves superimposed on the bars represent the regression lines. The regression lines appear to fit the pattern of means well. Other analyses (not shown) indicate that they fit better than parabolic models, which are pointier and symmetric about the minimum, and they fit as well as third-order polynomial models, which are asymmetric but require an additional parameter.[2]

FIGURE 1. Depression and Age. Bars represent crude means for the age groups. The number of cases in each age group is given inside its bar. Curved lines represent a function fitted to the individual-level data (Column 1 of Tables 1 and 2): $\hat{D} = b_0 + b_1 \ln(\text{Age} - 17) + b_2(\text{Age} - 18)^3$



The "optimum age" is defined as that associated with the lowest predicted depression. It marks the center of the broad middle-aged valley of the depression curve. At the optimum age, the rise in depression due to factors such as physiological dysfunction exactly cancels the decline due to factors such as greater maturity. Figure 2 illustrates the total age curve of the U.S. sample, and its falling and rising components (D_f and D_r). Both components of the non-linear association are significant, as indicated in Table 1 (column 1, rows 1–3). The optimum age is 44.7 years in the unadjusted regression (row 20). The Illinois sample produces similar results, with an optimum age of 44.5 (Table 2, column 1, row 18).

TABLE 1. Progressive Adjustment, *1990 United States Sample* (N = 2,031): Depression Regressed on Age (Falling and Rising Components), Minority Status, Sex, Employment Status, Marital Status, Economic Status, Sense of Control and Physical Dysfunction (Metric Coefficients)

Variable	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5	Eq. 6	Eq. 7
1.[a] $\hat{D}$ at age 18 (b_0)	1.346***	1.380***	1.364***	1.303***	1.158***	1.144***	1.453***
2.[a] ln(Age − 17)	−.166***	−.177***	−.172***	−.136***	−.049	−.055	−.135**
(t_b)[g]	(−3.822)	(−4.100)	(−3.964)	(−3.162)	(−.966)	(−1.508)	(−2.811)
3.[b] (Age − 18)^3(10^{-6})	2.792***	2.783***	2.775***	1.642**	1.073	−.330	−2.007**
(t_b)[g]	(4.768)	(4.779)	(4.768)	(2.778)	(1.302)	(−.406)	(−2.610)
4. Female		.285***	.286***	.268***	.178**	.119*	.098*
5. Minority			.138*	.086	.025	−.039	−.058
6. Education				−.088***	−.076***	−.055***	−.014
7.[c] School					.123	.102	.114
8.[c] Unemployed					.673***	.550***	.089
9.[c] Part time					.279**	.278**	.269**
10.[c] Housekeeping					.279**	.314***	.234**
11.[c] Retired					.244*	.295**	.163
12.[d] Single					.301***	.277**	.209**
13.[d] Divorced					.382***	.276**	.278***
14.[d] Widowed					.691***	.637***	.506***
15. Earnings ($k)						−.008	.001
16. Other income ($k)						−.001	.000
17. Economic hardship						.404***	.313***
18. Perceived control							−.322***
19. Physical dysfunction							1.500***
20.[e] Optimum age	44.732	45.347	45.111	47.894	42.454	.[f]	.[f]
R^2	.011	.023	.024	.053	.094	.133	.235

Independent variables other than age are measured as deviation scores, making the intercept the predicted value at age 18 for the average respondent.

† p<.10; * p<.05; **p<.01; *** p<.001 (2-tailed).

[a] Falling age curve.

[b] Rising age curve.

[c] Compared to full-time employed.

[d] Compared to married.

[e] Age of lowest predicted depression.

[f] Undefined.

[g] t-values.

Survival Components

Many social statuses that decrease survival also increase depression. Thus, low survival among the most depressed social groups can produce an apparent fall in depression with age. The results indicate that as much as 68.9 percent of the falling component *could* be attributable to low survival among people with low education, no job, no spouse, and little income. Adjustment for these factors reduces the coefficient of the falling component (D_f) by 68.9 percent in the U.S. data (.689 = [−.177 − (−.055)]/−.177), from columns 6 and 2 of row 2 in Table 1), and by 22.2 percent in the Illinois data (parallel calculations, Table 2). In both samples, adjustment reduces the coefficient of the falling component, as expected given low survival in the most depressed groups. However, most of the drop in the coefficient occurs with adjustment for employment and marital status (compare columns 4 and 5, row 2, in Tables 1 and 2). No drop occurs with adjustment for minority status (compare columns 2 and 3, row 2) or economic status (columns 5 and 6). Thus, the link to survival shared by minority status, education, employment, marriage, and economic well-being may not be the operative factor.

Sex is the only known factor that could account for part of the *rising* component (D_r) through differential survival. Females are more depressed than males, but they survive longer. When sex is adjusted, the coefficient of the rising component is reduced by 0.3 percent in the U.S. data and by 7.5 percent in the Illinois data (comparing columns 1 and 2 of row 3 in Tables 1 and 2, respectively). In both samples, the direction of the change with adjustment is as expected based on differen-

TABLE 2. Progressive Adjustment, *1985 Illinois Sample* (N = 809): Depression Regressed on Age (Falling and Rising Components), Minority Status, Sex, Employment Status, Marital Status, Economic Status and Sense of Control (Metric Coefficients)

Variable	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5	Eq. 6	Eq. 7
1.[a] $\hat{D}$ at age 18 (b_0)	1.927***	1.942***	1.931***	1.926***	1.935***	1.916***	1.979***
2.[a] ln(Age − 17)	−.294***	−.293***	−.290***	−.276***	−.235**	−.228**	−.242**
(t_b)[f]	(−4.143)	(−4.167)	(−4.152)	(−3.956)	(−2.676)	(−2.572)	(−2.746)
3.[b] (Age − 18)^3(10^{-6})	5.057***	4.676***	4.706***	3.884***	1.008	.926	.457
(t_b)[f]	(5.770)	(5.344)	(5.417)	(4.253)	(.883)	(.810)	(.400)
4. Female		.330***	.316***	.295***	.250**	.216*	.221*
5. Minority			.436***	.390**	.349**	.346**	.293*
6. Education				−.049**	−.041*	−.033†	−.018
7.[c] School					.251	.181	.274
8.[c] Unemployed					−.304	−.410	−.360
9.[c] Part time					−.038	−.093	−.082
10.[c] Housekeeping					.000	−.086	−.060
11.[c] Retired					.332*	.212	.200
12.[d] Single					.110	.075	.060
13.[d] Divorced					.415**	.395**	.454**
14.[d] Widowed					.702***	.694***	.704***
15. Earnings ($k)						−.007†	−.004
16. Other income ($k)						−.003	−.002
17. Perceived control							−.362***
18.[e] Optimum age	44.520	45.210	45.052	46.379	60.356	61.105	73.726
R^2	.040	.057	.071	.075	.115	.117	.132

Independent variables other than age are measured as deviation scores, making the intercept the predicted value at age 18 for the average respondent.

† p<.10; * p<.05; **p<.01; *** p<.001 (2-tailed).

[a] Falling age curve.

[b] Rising age curve.

[c] Compared to full-time employed.

[d] Compared to married.

[e] Age of lowest predicted depression.

[f] t-values.

tial survival, but it is only a small part of the rising curve.

Educational Trend Component

Average levels of education increased in successive generations of Americans. As a consequence, some depression appears to be caused by advancing age, but is not. It actually reflects greater depression among people with lower education, who tend to be older. In the U.S. sample, 40.8 percent of the rising curve vanishes with adjustment for education (.408 = [2.775 − 1.642]/2.775, from columns 3 and 4 of row 3 in Table 1). In the Illinois sample, 17.5 percent of the rising curve vanishes (parallel calculations, Table 2).[3]

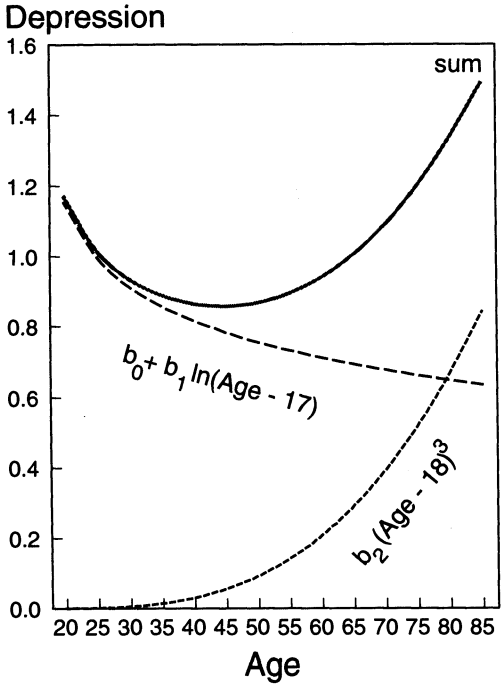
Although education accounts for a substantial part of the rising component, it accounts for a smaller part of the overall U-shaped pattern of depression by age. Equations 1 and 4 in Figure 3 represent the corresponding U.S. regressions in Table 1. Adjustment for education and the other fixed attributes flattens the curve noticeably, but not entirely. Education accounts for most of the difference. The adjustment lowers predicted depression in the oldest groups, and increases the optimum age by about three years. On the whole, though, the two curves follow a similar form. The Illinois data produce the same pattern.

Maturity, Decline, and Life-cycle Components

Although maturity and decline are opposite views of age, they are not mutually exclusive. The combined forces of maturity and decline could account for the U-shaped curve, but so could life-cycle changes in status. The results suggest that all three forces shape the age curve.

The emotional advantage of middle age rests chiefly on marriage and employment—the core life-cycle statuses. In the U.S. data, adjustment for marital and employment status

FIGURE 2. Falling and Rising Components of Depression by Age (U.S. data). The solid curve sums the dashed curves below, which represent the falling (D_f) and rising (D_r) components

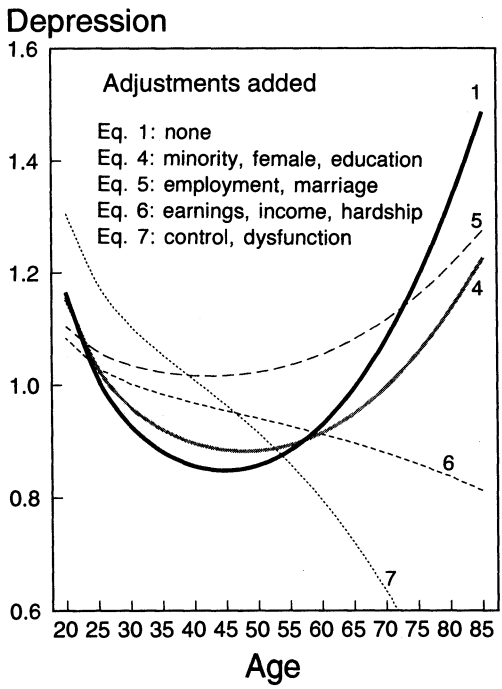


raises the middle-age valley of the depression curve and lowers the old-age peak. Figure 3 shows the flattened curve representing equation 5 of Table 1. If age-group differences in marital and employment status did not exist, age-group differences in depression would largely disappear. Column 5 of Table 1 shows that the unemployed, part-time workers, housekeepers, and retired are significantly more depressed than the full-time employed. (Only students are not more depressed than the full-time employed.) The single, divorced, and widowed are significantly more depressed than the married. Rows 2 and 3 of Table 1 show that both the falling and rising components of the depression curve become insignificant with adjustment for marital and employment status.[4]

Economic status rises and falls with age, along with employment and marriage. Figure 3 shows that the upward trend of depression in later life drops downward after adding the adjustment for economic status to that for marital, employment, and sociodemographic status. Rows 15, 16 and 17 of Table 1 show that hardship accounts for the impact of economic status on depression. Personal earnings and other family income do not affect depression directly. Trouble paying bills and providing personal and family needs links low earnings and income to depression. Comparing curves 4 and 6 in Figure 3 suggests that life-cycle patterns of employment, marriage, and economic well-being explain the emotional advantages of middle age and disadvantages of old age.

The Illinois data also reveal the importance of life-cycle changes in status. However, data limitations cloud the results a little. The Illinois data contain no measure of economic hardship. Also, small numbers of persons in some employment categories produce insignificant and erratic differences in depression compared to the employed. Nevertheless, Table 2 shows that the rising curve becomes insignificant with adjustment for marital, employment, and economic status. A graph of the Illinois data would show that, as in the U.S. data, the emotional advantage of being

FIGURE 3. Progressive Adjustment of Depression by Age (U.S. data). Equation numbers correspond to regression columns in Table 1. Each equation adjusts for the variables listed after the colon, plus all the variables adjusted in equations with lower numbers

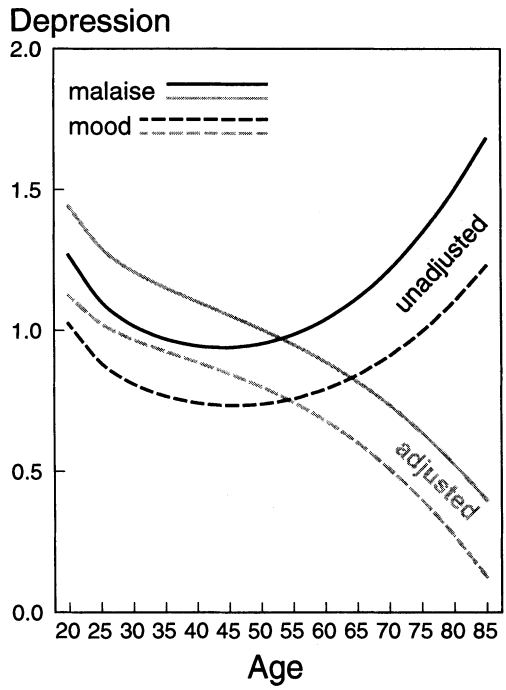


middle aged rather than old vanishes with adjustment for life-cycle differences in status.

The balance of decline and maturity creates a somewhat level base of depression beneath the fall and rise due to the social life cycle. Old age often brings physical dysfunction and erodes the sense of control over one's own life and destiny. The U.S. data show that declining function and control increase depression (rows 18 and 19 of Table 1). The erosion of function and control contributes to the rising depression curve (D_r), over and above the loss of jobs, partners, and economic well-being. Comparison of curves 6 and 7 in Figure 3 shows that age-group differences in function and control enhance the well-being of younger adults compared to older ones. Adding the adjustment for physical dysfunction and sense of control raises the depression predicted for younger adults and lowers it for older ones. (The Illinois data produce similar results, except the changes with adjustment are smaller because there is no measure of physical dysfunction.)

The residual fall in depression, after adjustment for social, economic, and functional status, suggests the force of maturity. In both the U.S. and Illinois data, the coefficient of the declining curve remains significant after all adjustments are made (row 2, column 7, of Tables 1 and 2). For the U.S. data, curve 7 of Figure 3 shows that predicted depression drops in successively older age groups, after adjustment for differences in social and functional statuses. The pattern suggests that, were it not for the gain and loss of partners, jobs, and wealth, and the late-life declines in function and control, average levels of depression would decrease throughout the lifetime.

FIGURE 4. Malaise and Mood Components of Depression by Age (U.S. data). In each pair of curves, the higher one represents malaise (can't get going, everything's an effort, trouble sleeping, can't concentrate). The lower one represents depressed mood (sad, lonely, blue). The age curve of malaise parallels that of depressed mood. Black lines represent unadjusted curves, like Eq. 1 in Figure 3. Gray lines represent curves adjusted for all the independent variables, like Eq. 7 in Figure 3



Physiogenic Bias Ruled Out

Lethargy, distraction, and apathy are part of depression. Sometimes, though, malaise might result from purely physical illness that has nothing to do with depression. This raises the *possibility* that apparent differences in depression between age groups actually reflect malaise from physical illness without sadness. However, analyses indicate that the differences among age groups cannot be attributed to differences in malaise alone. Figure 4 shows regression curves for equations 1 and 7 fitted to separated indexes of malaise and depressed mood in the U.S. data. Mood and malaise sub-indexes show the same relationship with age. The curves differ only in level, with malaise reported more frequently than sadness. (The Illinois data produce the same result.)

Excess malaise represents the differences between a person's levels of malaise and sadness. Concretely, it assesses the lethargy, sleep problems, and distraction that do not coincide with feeling sad, lonely, and blue. Excess malaise scores do not correlate significantly with the total depression index in either sample ($r = .032$ in the U.S. data and .009 in the Illinois data, $p > .80$ in both). As a consequence, adjusting the regressions of Tables 1 and 2 for excess malaise by

including it as an independent variable does not change the results. Of the independent variables, only physical dysfunction correlates significantly with excess malaise ($r = .211$; $p < .01$). The correlation does not bias estimated effects of dysfunction on depression, because such bias requires a significant and sizable correlation with *both* the dependent and independent variable.

DISCUSSION

Broadly speaking, the results show that depression is lowest among the middle aged, higher among younger and older adults, and highest among the oldest. Depression reaches its lowest level around age 45. The U-shaped pattern agrees with the implications of a meta-analysis that found levels of depression *de*crease with age in surveys of young and middle-aged adults, but *in*crease with age in surveys of older adults (Newmann 1989). The present study now demonstrates the pattern of depression falling and then rising in successive age groups over the full adult range from 18 to 90.

Depression Among the Old: No Myth

The results leave little doubt that the oldest age groups average high levels of depression. In both the Illinois and the U.S. surveys, people 80 years old and older report the most depression, and those 70 to 79 report the next most.

As noted in the introduction, Feinson's (1985) review of the literature casts doubt on the emotional difficulties of old age, calling it a "scientific myth" (Feinson 1985 a, b; Feinson and Thoits 1986). Thoits (1987) reiterated that doubt, saying, "Despite the prevailing belief that psychological problems are endemic among the elderly, especially among elderly women, equal numbers of studies indicate that disturbance increases with age, decreases with age, or has no relationship with age at all! Consequently, until consistent evidence emerges that elderly women are at high risk compared to younger women . . . this subgroup is deemphasized . . ." (Thoits 1987, p. 95).

The convergent results of two surveys reported in the present study go a long way toward providing that evidence (see also Kennedy et al. 1989). Thoits (1987) goes on to underscore, quite rightly, the emotional suffering of women who are minorities, separated or divorced mothers, or abused. We add to that list the emotional suffering of women and men who have lost their jobs, their partners, their wealth, their sight and hearing, their strength and mobility, and the control of their own lives and destinies.

The situation for the oldest age groups may be even worse than it appears. In the introduction, we argue that artifact may account for the inconsistency of earlier results. Studies variously truncated samples by age, mixed other considerations in with the assessment of depression, compared the elderly to a varying mix of other age groups, considered only linear age effects, or adjusted for a varying mix of factors indicating maturity, decline, life-cycle, historical trend, or survival. Regardless of other weaknesses or strengths, all of the studies, including the two reported here, share one trait. Attrition of the most depressed elderly, through death, institutionalization, and incapacitation, may attenuate the apparent rise of depression in old age. Things may be worse than they seem in the oldest age groups.

Depression Among the Old: Physiogenic, but Not Biased

Lethargy, troubled sleep, and distraction typify depression as much as does feeling sad and lonely. In theory, counting malaise as depression may create physiogenic bias when comparing older persons to others. The elderly could suffer more than others from malaise that reflects disease and infirmity rather than depression. If so, the high depression scores of the elderly could represent malaise not accompanied by depressed mood. However, the results of this and other studies indicate that high depression scores among the elderly do not result from physiogenic bias. They do, however, partially reflect high levels of physical dysfunction associated as much with depressed mood as with depressed vigour.

Several results imply that physiogenic bias does not account for the apparent age-group differences in depression. First, the age curve of depressed mood parallels that of malaise. The two fall and rise together. Second, adjustment for physical dysfunction produces

the same changes in the age curve of depressed mood as in that of depressed vigor. Third, excess malaise is uncorrelated with the overall depression index. Excess malaise consists of lethargy, sleep problems, and distraction that do not coincide with depressed mood. The difference between malaise and sadness subscores correlates little with their sum ($r = .032$ in the U.S. data). As a consequence, excess malaise cannot and does not bias any correlation with the sum index. Fourth, controlling for excess malaise does not change any of the regression results. Notably, controlling for excess malaise does not change the estimated coefficients of age or dysfunction. Thus, excess malaise does not explain either the age curve of depression or the change in that curve with adjustment for dysfunction. (These regression results follow logically from the lack of correlation between depression scores and excess malaise.) Finally, a confirmatory factor model reported elsewhere shows that all the correlation of age with the malaise and mood subscales reflects its correlation with their common factor of depression (Mirowsky and Ross 1991, 1992). Age does not correlate with malaise except through the depression factor.

Together, the results imply that depression among the old is not an illusion. Depression may rise among the elderly because of disease and infirmity, but the rise is not simply declining health in disguise.

Depression Across Age Groups: The Five Views

Across the adult life-cycle as a whole, the gain and loss of partners, jobs, and wealth explains the U-shaped relationship between depression and age. Retirees, housewives, part-time employees, and the unemployed are more depressed than full-time employees. The single, divorced, or widowed are more depressed than people who are married. Those with recent trouble paying bills and meeting family needs are more depressed than people free of economic hardship. Adjustment for life-cycle differences in marital, employment, and economic status flattens the age curve of depression. The results suggest that were it not for the gain and loss of partners, jobs, and wealth, there would be little or no fall and rise in depression in successive age groups. In this sense, life-cycle changes in social and economic status explain the age curve of depression.

The balance of maturity and decline forms a base beneath the gains and losses of the social life-cycle. The progressively accelerating decline of physical function and personal control apparently cancels gains that otherwise would flow from greater maturity. With all the functional and social statuses adjusted, predicted depression drops throughout the lifetime. The residual decline in depression suggests an underlying benefit of maturity. Unfortunately, rising physical dysfunction and declining personal control expend the emotional assets of maturity.

The link between age and depression through maturity is inferred. The data for this study do not provide independent measures of maturity. The residual decline in depression, which parallels the known fall in risky and criminal behavior, *suggests* that greater maturity reduces depression. Direct measures of maturity would strengthen future studies. Until then, maturity seems a reasonable interpretation of the residual fall in depression.

Survival traits related to depression influence the age pattern as expected, but probably do not account for most of it. The estimates show that high depression among groups with low survival rates *could* produce as much as 68.9 percent of the *falling* component of the depression curve. However, a closer look suggests that only a part of the estimate reflects differences in survival. Minority status and poverty do not contribute to the falling component, even though they decrease survival and increase depression. Marital and employment status definitely contribute to the falling component, but this probably reflects the marriage and employment of young adults more than mortality among the unmarried and non-employed. On the other side, the longer survival and greater depression of women compared to men could produce, at most, 7.5 percent of the rising curve. Overall, differences in survival across social groups probably create some of depression's age curve, but not most of it.

To some extent, the rise in depression associated with late adulthood reflects the progress of our society toward better lifetime conditions. Increasing average education provides the best single indicator of that progress. Lower education accounts for as much as 41 percent of the rising depression

curve. One tends to think of the greater depression among older adults as something to be eliminated. However, some part of it reflects the success of the older generations in providing a better life for their offspring and successors than they themselves enjoyed. To that extent, it represents an achievement of the older generations that many would hope is sustained and advanced by succeeding generations.

CONCLUSION

Is being older depressing? The answer seems to be no, not in itself. Young adults seem to benefit psychologically from getting older. Middle-aged adults are the least depressed of all. Average levels of depression rise with age over 60. Retirement, widowhood, and economic hardship account for the rise. Physical degeneration and the loss of personal control contribute too. Older Americans who do not suffer personal, status, and functional losses apparently have low depression. Such losses probably will remain correlated with age regardless of policies and adaptations. However, the rate of loss with age can be reduced. Also, the effects may be tempered through greater community, economic, and social involvement of older adults. If depression from the loss of jobs, partners, wealth, and function subsides, then well-being from maturity may surface.

NOTES

1. The model does not include interactions, because the literature does not point to any likely to produce the U-shaped relationship between depression and age suggested by Newmann's (1989) meta-analysis. With two age variables and 16 other independent variables, there are 32 possible interaction terms. If tested, one or two would be significant on a purely random basis. If an interaction exists, then the model's age coefficients represent effects averaged across sample levels of the interacting variable (Aiken and West 1991).
2. High correlation of the two age curves does not account for their significant coefficients. Multicollinearity would not produce spuriously significant effects of both age terms. The classic sign of multicollinearity involving two independent variables is that either one alone is significant, but together neither is significant. High correlation between the estimates of the two coefficients inflates the standard errors of both, making the estimates insignificant (see Hanushek and Jackson's Table 4.3). The results in Tables 1 and 2 show that each age term is significant in the presence of the other. The correlation between age terms is .657 in the U.S. data (43% variance in common) and .692 in the Illinois data (48% in common). The correlation is not large enough to cause serious problems.
3. A reviewer suggested that the effect of education might vary across age groups, because education norms differ across cohorts. Subsidiary analyses of the U.S. data show no significant interaction of education with the falling and rising age components (p-values of .193 and .654, respectively, when added to equation 4).
4. In subsidiary analyses, adjustment for the number of children under 18 in the home, and for the presence of pre-schoolers, did not explain part of the age curve. The reason is that the overall effect of children on depression is negligible. Children are depressing to some groups (employed women with young children and trouble arranging child care, or families experiencing economic hardship) but improve the well-being of others (employed mothers whose husbands share the housework equally, have no difficulty arranging child care, and are free of economic hardship). Overall, the effect of children is insignificant, and thus does not contribute to the age curve.

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