Sustained Personal Autonomy:

A Measure of Successful Aging

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Objectives: This study addresses the following question: What characteristics of urban, noninstitutionalized elders predict which individuals are most likely to remain independent of personal assistance during a 2-year observation period? **Methods:** A population-based sample of 602 noninstitutionalized urban residents aged 70 and older was followed for 2 years. **Results:** Ninety-eight of the 487 survivors remained independent. Factors associated with sustained independence were relatively younger age, male gender, fewer medical conditions, good physical function, and nonsmoking. The attitudes "favors family or self over agency assistance" and "does not expect filial obligation" were also independently associated. **Discussion:** The results are consistent with previous studies of successful aging and show that attitudes expressed at baseline favoring personal independence are associated with sustained autonomy during a period of at least 2 years.

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Most of us are acquainted with at least one older individual who continues, sometimes surprisingly, to maintain physical activity and to remain free of the need for health care and other services well beyond the age of 80 or even 90 years. Such exemplars of independent aging evoke not only our admiration but also our curiosity. Have these fortunate people simply inherited good genes, or is it possible that they have consciously sought and maintained their independence by means of healthy attitudes and lifestyles? How can we recognize such persistently independent elders and distinguish them from their peers who are destined to become dependent?

In this article, we present evidence that among a population-based group of urban elderly persons certain characteristics can be used to predict which individuals are most likely to remain independent of any kind of personal assistance over the next 2 years. We suggest the term *sustained personal autonomy* to describe these exceptional individuals.

In recent decades, research on the health and function of aging persons has tended to focus on the prediction of negative outcomes such as disability, dependency, morbidity, and mortality (Boult, Kane, Louis, Boult, & McCaffrey, 1994; Maddox & Clark, 1992; Nagi, 1976; Pinsky et al., 1985) or to be based on samples limited to frail individuals (Manton, Stallard, & Corder, 1995; Wolinsky, Stump, Callahan, & Johnson, 1996).

In striking contrast, a different view of old age can be traced back more than 2,000 years to Cicero's famous essay "De Senectute" (Cicero, 44 B.C./1992) in which he expressed the stoical opinion that in old age, free of the demands of bodily needs and pleasures, it is finally possible to focus on the further development and enjoyment of the mind. In the 20th century, this optimistic perspective has found a new expression in the term *successful aging*.

Early research on this topic stemmed from the theory of action developed by Talcott Parsons (1951) and from the life span developmental theory of Erikson (1959). A contrasting disengagement theory

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of aging was later put forth by Cumming and Henry (1961) on the basis of case histories collected in the "Kansas City Study of Adult Life." Their theory pictured a gradual process of accommodating to the losses and disabilities associated with aging. One chapter of their report was devoted to the difficulty of objectively defining successful aging—a problem that has been noted by several subsequent investigators as well (Dean, MCCaffrey, & Cassetta, 1961). Nevertheless, the search for an operational definition has continued, as reflected in a number of longitudinal studies conducted in the 1950s and 1960s.

Interest in the subject then appeared to taper off but was revived in 1987 when two events stimulated investigators in several different fields to reexamine the positive side of old age with new theories and new longitudinal surveys. In that year, Rowe and Kahn (1987) published a paper in *Science* titled "Human Aging: Usual and Successful," and a workshop on successful aging was held in Bavaria (Baltes & Baltes, 1990). Since that date, there has been a remarkable proliferation of studies by biologically, psychologically, and sociologically oriented investigators, each with a different slant on successful aging. The examples that follow show the great variety of perspectives that have been presented. These definitions are selected from those used in longitudinal studies to avoid the misleading chance associations that can occur in simple cross-sectional surveys.

A primarily biological definition is illustrated by the Alameda County studies of healthy or successful aging, which was defined as the top 20% on a scale of physical functioning, or "needing no assistance nor having difficulty in any of 13 activity/mobility measures plus little or no difficulty on five physical performance measures" (Guralnik & Kaplan, 1989, p. 704; Strawbridge, Cohen, Shema, & Kaplan, 1996, p. 136). Similarly, the definition of active life expectancy depends on the duration of life free of dependence in four basic activities of daily living (ADLs) (Katz et al., 1983). Another study that used a performance-based measure to identify a high-functioning cohort is one of the MacArthur Studies of Successful Aging (Seeman et al., 1994).

Different psychological definitions of successful aging have focused on cognitive function, perceived control, and life satisfaction. Schaie (1990) offers as a measure of successful aging "the optimization of cognitive functioning" and describes cognitive functioning as a com-

posite of verbal meaning, spatial orientation, inductive reasoning, number, and word fluency. Bandura (1986) has conducted extensive studies based on his concept of self-efficacy, by which he means "the exercise of control": "Perceived self-efficacy is defined as people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). He identifies the preservation of perceived self-efficacy as a means for coping with losses and achieving a healthy, productive old age. Life satisfaction as a measure of successful aging was recommended by Havighurst in 1961 and used by Palmore (1979), in combination with a physical-function measure, in longitudinal studies. An interesting definition, in view of the criterion chosen for the present study, was that of Williams and Wirths (1965), who defined successful aging as a combination of autonomy (as opposed to dependency) and persistent (as opposed to precarious) lifestyle. This definition evolved in the course of the 5½-year Kansas City Study of Adult Life.

A sociological view of successful aging puts emphasis on proactive skills such as coping with stresses and losses, and on social interaction (i.e., the process of achieving successful aging). Kahana and Kahana (1996), building on Powell Lawton's concepts with regard to late life proactivity, have developed a multifactorial model describing such a process, in which the outcomes of successful aging are defined as positive affective states, a sense of meaning in life, and maintenance of valued activities and relationships.

Several other students of successful aging have recognized that the problem is multifactorial. Some have aimed at comprehensive definitions, using a biopsychosocial model. For example, in their discussion of the complexity of the definitional problem, Baltes and Baltes (1990) list the following characteristics as possible components: length of life, biological health, mental health, cognitive efficiency, social competence and productivity, personal control, and life satisfaction. Another example is Rowe and Kahn's (1997) tripartite definition: "low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life" (Rowe & Kahn, 1997). Similarly, in a 12-year study of Manitoba elderly, successful aging was defined as being independent in mobility and ADLs, cognitively intact, and not receiving nursing home or home care services (Roos & Havens, 1991).

In light of these wide-ranging approaches, the choice of an operational definition of successful aging is difficult and involves selection among many ideas and possible formulations. Complicating the problem is the fact that certain measurements used by some previous investigators can be construed as either predictor or outcome variables. Examples are self-rated health, absence of disease and disability, and staying out of nursing homes.

Rather than attempting a definition that would encompass the more complex conceptualizations of successful aging, we opted for a pragmatic definition: sustained independence during the period of observation. This definition has several advantages. All of its terms are readily measurable. It has face validity because many older persons would agree that not having to depend on anyone is a sign of successful aging. Health care providers are also familiar with distinctive older individuals who are almost defiantly independent. Furthermore, the term *sustained* encompasses the concept of survival, which has been redundantly included in a few of the definitions quoted above. Without specifying them, this definition also implies freedom from disabling illness and at least minimally intact cognitive function. It also refers to relationships with other people.

As will appear in the Method section, the use of a simple, clear outcome measure allows us to recognize the biopsychosocial nature of successful aging by including most of the other elements mentioned in the studies quoted above as possible predictors.

Method

SAMPLE

A sample of 602 noninstitutionalized persons aged 70 and older who resided in the Cleveland urban area were interviewed in 1993. These participants were survivors of a previous survey of elderly community residents who were selected by a random procedure from Medicare lists in 1975 and 1987 (Ford, Haug, Roy, Jones, & Folmer, 1992). Attrition of this sample between 1988 and 1993 is described in a previous publication (Noelker et al., 1998). In 1993, 827 individuals remained, of whom 602 (72.8%) agreed to participate in the study.

During the 2-year course of the study there was further attrition of 18.7% (10.1% due to death, 1.8% to a move, 6.5% who refused to continue, and 0.3% lost to follow-up), leaving 487 noninstitutionalized survivors at the end of the study.

DATA COLLECTION

Interviewers were recruited and trained to administer a modified form of the Duke Older Americans Resources and Services (OARS) instrument that covers five major domains: physical health, mental health, social resources, economic resources, and disability measured by limitations in performance of ADLs (Fillenbaum, 1988). Interviews were conducted by trained interviewers and took place in the participants' homes, beginning with an intake interview in 1993 (T_1), and reinterviews at 12 months (T_2, 1994) and 24 months (T_3, 1995). Proxy interviews were conducted in 2.3% of cases when a direct interview was prevented by the physical or mental status of the participant, as judged by the interviewer, plus a score of less than 5 out of 10 correct answers on the Pfeiffer Short Portable Mental Status Questionnaire (Pfeiffer, 1975).

MEASURES

Outcome variable. Independence was defined as receiving no help, in the form of either formal (paid) or informal (unpaid) service, with any of the personal or instrumental ADLs during the 2-year observation period. Assistance with personal ADLs was measured by responses to a detailed series of items. Instrumental activities of daily living (IADL) were also included because the focus of the study is on remaining independent of any assistance from another person. A total of 17 activities were examined, including seven personal care tasks (feeding self, dressing, grooming, transferring, bathing, toileting and walking), seven instrumental activities (use of telephone, transportation, shopping, meal preparation, housework, taking medication and handling money), plus three self-designated, highly valued activities, such as going to church or recreational activities. Visits to physicians

and hospital admissions were not included. Participants who entered nursing homes were classified as dependent.

Based on their dependency status, two categories were established for the 487 individuals who were studied at all three observation points. Those who received no services at T_1, T_2, and T_3 were classified as *sustained independence elders*, and those who received assistance at any time during the study were classified as dependent.

Predictor variables. All of the following variables were measured at T_1.

Demographic variables include age, gender, race, education (years), marital status (married, not married), and adequacy of income (scale score), based on responses to six questions.

Health-related variables include physical functioning as measured by six items from the Medical Outcomes Study (MOS) Short Form Health Survey, covering vigorous and moderate activities such as lifting, heavy housework, stair-climbing, kneeling, bending, or stooping (Ware & Sherbourne, 1992). This measure (omitting walking, bathing, and dressing) was selected to avoid confounding of outcome (ADL) and predictor variables. The number of medical conditions was based on the following list of chronic conditions, reported as diagnosed by a physician: arthritis, visual impairment, hypertension, hearing impairment, stroke, diabetes, hip fracture, lung disease, cancer, and up to three other conditions (Ford et al., 1988). Cognitive impairment was measured by the number of errors on the Pfeiffer 10-item scale (Pfeiffer, 1975) and depression was measured by the 20-item Center for Epdemiologic Studies [CES] of Depression Scale (Radloff, 1977).

Lifestyle variables refer to drinking, smoking, and exercise. Current drinking was indicated by a positive answer to the question, Do you ever drink wine, beer, or liquor?, current smoking by a positive answer to the question, Do you smoke at the present time?, and regular exercise by a positive answer to the question, Do you exercise regularly? For example: take walks, work in a garden, play golf, etc.

Attitudinal variables were selected to measure commonly expressed attitudes that could influence an older person's determination to remain independent of outside assistance. The first, based on Collins, Stommel, King, and Given's work (1991), was labeled "Favors family or self over agency," and consists of responses, on a 4-point agree/disagree scale, to 11 statements such as "Families should take care of their

older relatives and not ask for any help." A higher score represents a preference for self- or family care over services from an agency. This variable was labeled "concerns about using formal services" in a previous report (Noelker et al., 1998).

A second attitudinal measure, derived from Finch and Mason (1990) and Seelbach and Sauer (1977), "Expects filial obligation," is based on responses, on the same 4-point scale, to five statements such as "Family members should be willing to take care of an older relative who gets sick." Here, a higher score represents higher expectation of assistance from children and other relatives.

A third attitudinal measure, "Values religion," was developed by the investigators, based on the sum of weighted responses to three questions: Would you describe yourself as (four levels: *very* to *not at all*) religious?, Do you personally turn to private prayer (five levels: *daily* to *almost never*)?, and How much comfort do you find in religion in times of suffering and distress (four levels: *very much* to *not at all*)? A score consisted of the sum of the weights on the three sets of items, with a higher score representing a greater value attached to the practice of personal religion.

Self-ratings of health have consistently been shown to be significantly associated with a greater risk of mortality and with a decline in functional ability during 18 months (Idler & Kasl, 1995; Idler, Kasl, & Lemke, 1990). Therefore, the general health perceptions subscale of the MOS SF-36, which asks four questions about perception of health status, was included (Ware & Sherbourne, 1992).

STATISTICAL ANALYSIS

Univariate analysis, comparing the stable independent with the dependent participants, was evaluated by chi-square test for dichotomous variables and *t* test for continuous variables. Multivariable logistic regression was then used to determine the independent contribution of individual variables to predicting sustained independence (SPSS-PC). Results of the regression are reported as odds ratios for discrete variables and as the odds ratio of the 75th percentile versus the 25th percentile for continuous variables (Hosmer & Lemeshaw, 1989).

Results

Although this research cohort had previously been shown to be representative of the noninstitutionalized population from which it was drawn (Ford et al., 1992), a check of current status was made. Compared with the 1990 census data, the mean age for the 602 persons in the sample (78 years) was almost identical with that of persons aged 70 years and older in the reference city (mean 77 years) and county (mean 77 years). (About two thirds of the sample was drawn from the city and the remaining third from adjacent suburbs.) A somewhat smaller proportion of males in the sample (33%, compared with 36% in the city and 37% in the county) may reflect the fact that men are usually more difficult to recruit in surveys. In terms of race, the sample (70% Whites) was intermediate between the proportions in the city (65% Whites) and the county (84% Whites) (U.S. Department of Commerce, 1993). Thus, the study sample, which was drawn mainly from the city of Cleveland but also partly from suburban communities in the county, appears to have remained reasonably representative of the entire noninstitutionalized older population of this urban area.

To check for possible selection bias, the 602 participants who agreed to participate were compared with the 224 who refused. Of six characteristics compared, only race showed a statistically significant difference. Seventy-six percent of those who refused were White, compared with 67.4% of those who participated ($\xi^2 = 5.63$, $p = .018$). There were no significant differences in terms of age, gender, marital status, education, or income.

By the end of the 2-year observation period, 98 (20.1%) of the 487 survivors met the criterion for sustained independence, receiving no services at T_1, T_2, or T_3. The remaining 389 individuals (79.9%) received services at some or all of the three observation points and were taken as the comparison group. Within this dependent group, the largest subset, consisting of 200 individuals (41.1% of the total), received services at all three points. A second subset of 139 persons (28.5% of the total) were classified as increasingly dependent because they received more services at one or both of the observational steps (T_1 through T_2 or T_2 through T_3), ending more dependent than at intake. A small subset of 50 individuals (10.3% of the total) were classified as

Table 1
Sustained Independence Elders Compared With Dependent Elders in Terms of Demographic, Health, Lifestyle, and Attitudinal Variables, Measured at T_1, Univariate Analysis

Variable	*Sustained Independence Elders* (n = *98*)	*Dependent Elders* (n = *389*)	p *Value*
Demographic			
Age (mean years)	75.7	78.0	<.001
Gender (% male)	49.0	24.9	<.001
Race (% Black)	25.5	36.8	.04
Education (mean years)	10.8	10.0	.01
Marital status (% married)	53.1	33.4	<.001
Adequate income (mean score)	11.2	10.0	<.001
Health			
Physical function (MOS mean score)	79.5	57.0	<.001
Medical conditions (mean number)	2.1	3.1	<.001
Cognitive impairment (Pfeiffer mean score)	0.3	0.6	<.001
Depression (CESD mean score)	5.4	8.6	<.001
Lifestyle			
Current nondrinkers (%)	50.0	63.0	.02
Current nonsmokers (%)	87.8	83.8	.33
Does not exercise regularly (%)	24.5	40.6	<.01
Attitudes			
General health perceptions (mean score)	74.9	63.8	<.001
Favors family or self over agency (mean score)	27.5	26.1	<.001
Expects filial obligation (mean score)	14.0	14.4	.14
Values religion (mean score)	4.4	4.0	.06

Note. MOS = Medical Outcomes Study and CESD = Center for Epdemiologic Studies Depression Scale.

temporarily dependent because they received services at T_1, T_2, or both, but none at T_3.

Independent and dependent persons were next compared by univariate analysis in terms of 17 demographic, health, lifestyle and attitudinal variables (see Table 1). All of these variables, except for nonsmoking, "expects filial obligation," and "values religion" were significantly correlated ($p < .05$) with sustained independence. Next, to establish which variables could be considered independent predictors, the same terms were entered into a logistic regression, the results of which are shown in Table 2.

Table 2
Sustained Independence Elders Compared With Dependent Participants by Multivariable Logistic Regression

Predictor Variable	*Odds Ratio*	*95% Confidence Intervals*	p *Value*
Demographic			
Age (younger, 5-year units)	1.86	1.35-2.56	<.001
Gender (male)	2.95	1.75-4.97	<.001
Race (Black)	1.03	0.57-2.09	.99
Education (less years)	1.08	0.89-1.30	.67
Marital status (married)	1.29	0.75-2.22	.44
Adequate income (scale score)	1.44[a]	0.92-2.25	.11
Health			
Physical function (MOS score)	2.27[a]	1.26-4.06	.006
Medical conditions (fewer)	2.01[a]	1.37-2.95	<.001
Cognitive status (better)	1.09[a]	0.75-1.59	.53
Depression (CESD score)	1.03[a]	0.67-1.60	.65
Lifestyle			
Current nondrinkers	1.00	0.59-1.71	.90
Current nonsmokers	2.14	1.02-4.48	.04
Does not exercise regularly	1.01	.54-1.89	.90
Attitudes			
General health perceptions (MOS score)	1.28[a]	0.73-2.27	.35
Favors family or self over agency (scale score)	1.65[a]	1.22-2.22	.001
Expects filial obligation	0.77[a]	0.60-0.99	.045
Values religion (scale score)	1.05[a]	0.90-1.22	.58

Note. MOS = Medical Outcomes Study and CESD = Center for Epdemiologic Studies Depression Scale.
a. Odds ratio of the third quartile Q_3 versus the first quartile Q_1.

Two of the six demographic characteristics proved to be significantly associated with independence: relatively younger age (odds ratio [OR] 1.86 per 5 years, confidence interval [CI] 1.35 to 2.56) and male gender (OR 2.95, CI 1.75 to 4.97). Race, education, marital status, and adequacy of income were not associated. In terms of health, good physical function (OR 2.27, CI 1.26 to 4.06) and fewer medical conditions (OR 2.01, CI 1.37 to 2.95) were associated with stable independence, but cognitive impairment and depression were not. Of the three lifestyle variables, only nonsmoking showed a significant association (OR 2.14, CI 1.02 to 4.48), whereas not drinking and regular exercise were not predictive of sustained independence. The significant attitudinal variables included two independent factors, namely, "favors family or self over agency" (OR 1.65, CI 1.22 to 2.22) and "expects filial obligation" (OR 0.77, CI 0.60 to 0.99), with no

significant association shown between independence and "values religion" or general health perceptions.

Because the largest odds ratio was associated with gender, the univariate and multivariable analyses were repeated separately for the 145 men and 342 women. No new predictors were identified, but the number of significant independent variables for each gender was smaller, probably because of reduced sample size. The attitude "favors family over agency" remained significant for males ($p = .014$), and "does not expect filial obligation" remained significant for females ($p = .006$).

Discussion

The results confirm previous reports and identify two new attitudinal measures that are predictive of sustained autonomy. Taken together, all the significant predictors form a coherent portrait of the elderly individuals who are most likely to achieve this state. In biological terms, we find that among the aged, relatively younger men and those with better physical function and fewer chronic conditions will be more likely to avoid dependency. These unsurprising characteristics have been shown previously, in longitudinal, population-based studies, to predict high levels of physical function (Guralnik & Kaplan, 1989; Strawbridge et al., 1996) or less need for social support (Kelman, Thomas, & Tanaka, 1994). Similarly, active life expectancy among aged persons, studied in another such survey, has also been reported to be longer for men and for relatively younger elders (Katz et al., 1983).

Age, gender, and good health are innate properties partially determined by genetics. Good physical function, on the other hand, probably reflects a sound basic anatomy and physiology maintained by good health habits. That is, the finding of good baseline physical function as a predictor indicates both good genes and a lifetime habit of keeping in good condition. Another good health habit found to be predictive in this study, namely nonsmoking, has also been shown in the Alameda County studies to predict similarly defined successful aging (Guralnik & Kaplan, 1989).

The new finding reported here is that psychosocial or attitudinal factors can also help to identify those who are more likely to remain independent. Aside from depression and cognitive function, which have sometimes been used in the definition of successful aging, psychosocial factors have rarely been examined as possible predictors of independence. Palmore reported that happiness was a predictor of successful aging, but this finding is difficult to interpret because happiness was also included in his definition of the outcome (Palmore, 1979). Absence of depression was found to be associated with successful aging in one study (Strawbridge et al., 1996), but not in the present study.

What we find is that persons who, at the time of intake into the study, agreed with the attitudinal proposition "favors family or self over agency" and disagreed with the proposition "expects filial obligation," were more likely than others to remain independent. The 11-item scale, favors family or self over agency, expresses a definite preference for depending on self or family for help, as opposed to receiving assistance from service agencies or government. Such attitudes recall fundamental American values that were expressed by Emerson in his once popular essay "Self-Reliance" (Emerson, 1841/1940). Emerson's ideas, in turn, reflected the autonomy and independence valued by Northern European Protestantism (Bellah, Madsen, Sullivan, Sidler, & Tipton, 1985; Weber, 1954). An alternative source of these attitudes for other participants in this study might be the family centeredness of Mediterranean and Latin families (Gaines, 1985; Gilmore, 1983). Both of these cultural orientations are represented in the sample.

The attitude of expecting filial obligation has been shown to receive limited endorsement by the elderly and to be viewed differently by parents and children. (Hanson, Sauer, & Seelbach, 1983; Seelbach & Sauer, 1977). The present study, in contrast, finds that elders, in particular elderly women, who did not expect their families to take care of them, were more likely to remain independent.

Taken together, these two attitudinal predictors are consistent with each other and with the image of those older individuals who are determined to remain autonomous and to accept assistance neither from outside agencies nor even from their own children.

These independent attitudes are clearly related to the general psychological and ethical concept of autonomy, the quality or state of being self-governing (Mish, 1990). Specifically, they appear to confirm Williams and Wirths' (1965) definition of successful aging as persistent autonomy and to be closely related to Bandura's broader notion of self-efficacy (Bandura, 1986).

Such attitudes are akin to those that would be predicted from hypotheses that associate successful aging with active engagement with life (Rowe & Kahn, 1987) but different from others that stress maintenance of valued activities and relationships (Kahana & Kahana, 1996). The set of older persons identified in the present study may in fact be made up of individuals who appear to distance themselves from potential support systems, including children and formal support services. It is interesting that the attitude associated with sustained autonomy for women expresses independence from their families, whereas men were more likely to define their attitude as not being dependent on outside agencies. Although such rugged individualism may be an admirable strength as long as health and good luck hold out, it can present ethical problems when they do not. For example, families may have difficulty persuading a determined parent to give up driving. Unquestioning respect for the autonomy of these stubbornly independent elders can lead to trouble, but it may be the only possibility and may, in fact, be exactly what they wish, regardless of consequences.

How numerous are these individuals in the elderly population? Few studies of older persons closely similar to the present one are available for comparison. For example, three cross-sectional surveys, the 1984 National Health Interview Supplement on Aging (Ries, 1986), the 1984/1985 Survey of Income and Program Participation (McNeil, Lamas, & Harpine, 1986), and the 1987 National Medical Expenditure Survey (Leon & Lair, 1990) give consistent estimates of the proportion of person aged 70 years and older who did not receive help with personal or instrumental ADLs, namely 61.5%, 65.2%, and 68.2%, respectively. These estimates are higher than that reported here, but there are explanations for the differences, mainly that the data in these surveys were all obtained in single interviews instead of

the present three interviews during 2 years and also because fewer activities were sampled in the national surveys.

On the other hand, there are five longitudinal, population-based studies that can be compared with the present one, although they differ in details: the 1971-1983 study of Manitoba elderly (Roos & Havens, 1991), the 1974-1985 Massachusetts Health Care Panel study (Branch & Ku, 1989), the 1965-1984 Alameda County study (Guralnik & Kaplan, 1989), the 1984-1990 Alameda County study (Strawbridge et al., 1996), and the 1984-1986 urban elderly (Bronx) study (Kelman, Thomas, & Tanaka, 1994).

In these studies, representative samples of elderly persons (65 years old and older) living in the community were evaluated at intake as to their independence in terms of ADLs and reevaluated after periods of 2 to 19 years. Using similar definitions of successful aging or sustained independence, the five studies found that 47%, 38.5%, 20%, 30%, and 38.2% of survivors, respectively, met these definitions. Combining these estimates with the 20%, 2-year estimate of the present study (omitting the Manitoba study, which was the most unlike the present one), we can conclude that the true proportion of persons older than 65 years who will be able to sustain autonomous function for 2 years or more probably lies between 20 and 39%.

This estimate is strengthened by a recent report from the National Institute on Aging. Persons aged 65 and older (n = 1,097) were followed prospectively for 10 years. Disability status was determined within 15 months of death; the probability of a nondisabled man's surviving to age 80 without disability was 26%, whereas, among the women, only 18% survived nondisabled to age 85 (Levielle, Guralnik, Ferrucci, & Langlois, 1999).

Three of the longitudinal studies just cited address the same question as the present study: What are the predictors of successful aging? How much consensus as to predictors of independence is there among the five comparable studies (present study, Manitoba, Alameda 1 and 2, and Bronx)? All five do agree on three baseline predictors of successful aging: relatively younger age, fewer medical conditions (defined somewhat differently in each study, but all statistically significant), and good physical function (this variable was not explicitly measured in the Manitoba study, but fair to excellent self-rated health was found to be a significant predictor); in the Bronx study a

significant predictor was "fewer problems in daily living." Discrepancies among the findings of these surveys may be attributable to differences in the populations sampled. Other explanations probably arise from differences in minimum age at baseline, period of observation, and definitions of both independent and dependent variables.

In view of the extensive research linking smoking with morbidity and mortality (U.S. Department of Health and Human Services, 1992), it is reasonable to find that nonsmokers are better able to remain independent than are smokers. Nonsmoking was also found to be predictive of high levels of physical functioning in the Alameda 1 study (Guralnik & Kaplan, 1989). In contrast, however, to a large body of evidence on mortality in younger populations, this study finds no association between sustained independence and either exercise or abstinence from alcohol use. The lack of association with alcohol abstinence may result from the competing effects of the benefit of small amounts of alcohol on cardiovascular mortality (DeLabry et al., 1992) and the detrimental effects of large amounts on health status (Stinson & DeBakey, 1992). Exercise has been shown, in an emerging body of evidence (Young, Masaki, & Curb, 1995), to be beneficial in maintaining function in the elderly, and it was associated with maintenance of independence in the univariate analysis but not in the logistic regression. The lack of independent association here may be partially due to control of confounding by health status in a population with a limited range of exercise.

The incidental finding that Whites are somewhat (8.6%) more likely to refuse to participate in the study is probably not relevant to the findings because responders and nonresponders were not different in terms of five other demographic characteristics. Furthermore, race did not prove to be a predictor of use of services in the final analysis ($p = .99$).

The force of certain unmodifiable factors such as age and gender seems to be great and might frustrate any effort to use the findings to improve the prospects of significant numbers of older persons. Moreover, it is well to bear in mind that in the psychosocial area we are dealing with complex phenomena, and inaccuracies in measurement may have biased the study toward finding no effect.

The criterion for successful aging used in this study (i.e., no personal assistance, paid or unpaid) sustained during a 2-year interval is stringent. Even though we lack a gold standard for measuring

independence, the chosen definition can be said to be highly specific because it is unlikely that any dependent individuals were classified as independent, but probably considerably less than 100% sensitive, because some who might consider themselves independent but who chose to accept help with such activities as housework or transportation, even though they didn't need it, might have been classified as dependent.

The fact that two new associations have emerged independently from a rigorous multivariable analysis may be an important clue. These findings call for further research, for replication, and for greater clarification of exactly what these characteristics represent. Do such attitudes arise from a deep personal trait, otherwise known as self-reliance or so-called self-efficacy? Do they reflect a lifelong pattern of managing on one's own? Or, are they an expression of familial insularity? Is a preference for independence conditioned by external circumstances, such as favorable socioeconomic status? Finally, if the findings hold up, there remain some critical ethical issues: Should the attitude of autonomy be encouraged, possibly even taught as a means for achieving successful aging? What should family and care providers do when stubbornly independent elders insist on continuing to drive or otherwise to put themselves and others in danger?

The concept of successful aging, as we have noted, has many facets, and definitions will differ according to the viewpoint of the observer. This study contributes to the debate, favors an operational definition based on accepted measurements, and presents evidence for a previously unrecognized relationship between physical functioning and specific attitudes.

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