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**Independence and older American women:
A concept exploration and analysis**

Margaret Wooding Baker

**A dissertation submitted in partial fulfillment of the
requirements for the degree of**

Doctor of Philosophy

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2000

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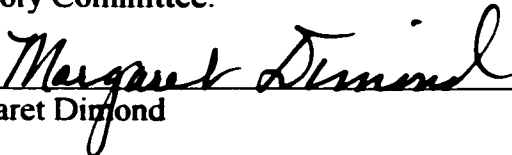
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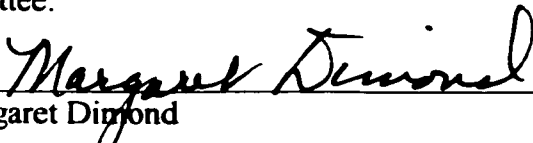
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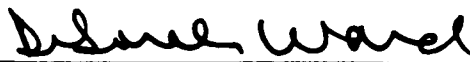
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Abstract

**Independence and older American women:
A concept exploration and analysis**

Margaret Wooding Baker

**Chairperson of the Supervisory Committee:
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The goal of many public and private programs in the U.S. is to help older Americans maintain their independence. Assessments of independence are sometimes reduced to a single outcome: living alone. There is no consensus in the literature as to the meaning of independence for older adults, making it difficult to assess or measure the intent or outcome of such programs. Review of the literature suggests that actual or perceived independence is influenced by historical and cultural factors, as well as physical, cognitive, psychological, social, spiritual and economic resources. Given the increased risk of chronic illness, disability, and poverty faced by older women in the U.S., it is hypothesized that older women are more at risk for loss of (or less) independence than older men, and that subgroups of older women face more of this risk. Using data from the Second Supplement on Aging, exploratory factor analysis was used a) to identify major components of independence and compare independence factors between men and women, and among subgroups based on age, race, ethnicity, marital status, living arrangement and income, b) determine the extent to which living arrangement is a proxy for independence, and c) develop a working definition of independence based on the

preliminary results. Major components of independence are physical function, social ability, and physical health. The strongest predictors of physical function are sex and age. Males have significantly higher scores than females, and physical function declines with age. Predictors of social ability are sex, age, race, ethnicity, living arrangement and income, although limitations in the data set may have introduced bias in assessing the effect of race and ethnicity on social ability. Physical health scores did not significantly differ by sex and age; marital status and income are significant predictors of poorer physical health. There is partial support for the assumption that living alone is a proxy for independence. Those who live alone have significantly higher scores on social ability than those with other living arrangements, but no significant differences on physical function or health. A working definition of independence is provided based on this preliminary model.

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DEDICATION

To Ryan.
For blessing me with your presence in my life.

To Bob.
For love and support that know no time, no limits.

To Dad.
For your constant presence and gentle guidance;
and, for all the pennies.

The race is not always to the swift...but to those who keep on running.

Unknown.

Chapter 1

Independence and older American women:

A concept exploration and analysis

Background

Over the next 50 years, there will be a marked increase in the population of older persons in the United States. This trend includes explosive growth in the 85-and-over age group and shifts in racial and ethnic diversity. Females will continue to make up the majority of the older population. When compared to older men, older women are at increased risk for chronic illness and disability, living alone, and poverty.

Many public and private programs have emerged in support of older persons in the U.S. The goal of many of these programs is to help older Americans maintain their “independence.” Assessments of independence are sometimes reduced to a single outcome: living alone. There is, however, no consensus in the literature as to the meaning of independence, thus making it difficult to accurately assess or measure the intent or outcome of such programs.

Review of the literature suggests that independence is not a dichotomous concept, but rather one that exists on a continuum with interdependence and dependence. It is also a dynamic concept, with perceptions or degrees of independence varying between or within individuals over time. Actual or perceived independence may be influenced by historical, cultural, economic, and social factors, as well as physical and cognitive ability. Variation in and among these factors may predispose individuals to greater or lesser levels of independence. Access to resources may also affect independence.

Given the sexism, classism, racism and ageism experienced by cohorts of women who are currently age 70-and-over in this country, and the increased risk of chronic illness, disability, and poverty faced by these women, it is hypothesized that among older, community-dwelling adults, women are more at risk for loss of (or lessened) independence than men. In addition, it is hypothesized that there are subgroups of older women, based on age, race, ethnicity, marital status, living arrangement, or income, who are more at risk for loss of (or lessened) independence. The first step in testing these hypotheses is exploration and analysis of factors attributable to the concept and development of an operational definition of independence.

The purposes of this study are to a) describe and analyze the concept of independence within the context of older, community-dwelling U.S. residents, using the Second Supplement on Aging (NCHS, 1998) and b) compare independence factors between men and women, and among subgroups.

Specific aims

1. Identify major components of independence using exploratory factor analytic techniques and the Second Supplement on Aging (NCHS, 1998) dataset.
2. Propose a model of independence based on factor analysis and literature review.
3. Compare factor scores among subgroups based on sex, age, race, ethnicity, marital status, living arrangement, and income.
4. Explore the extent to which living arrangement is an appropriate proxy for independence.
5. Suggest a working definition of independence based on these preliminary results.

Chapter 2

Independence and older Americans:

A realistic goal for all?

Introduction

In 1965, the Older Americans Act was passed as part of President Johnson's Great Society legislation. The goal of this act, "in keeping with the traditional American concept of the inherent dignity of the individual in our democratic society" (U.S. Code, 1999), was to enable older persons to live independently (Estes, 1979). The goal of many public and private programs for older Americans is to maintain their independence.

This goal warrants critique for several reasons. First, it assumes that older Americans are alike in their ability to achieve independence. This assumption is not necessarily valid because many older persons, especially women, face unique challenges based on age, marital status, race, ethnicity, living arrangement, and income. Second, use of the term *independence* is at issue, in that its meaning is either assumed, or reduced to a single variable (living alone) that may or may not accurately reflect this concept. Lastly, it assumes that all older Americans *have* independence to maintain, and that independence is a desired goal.

In this paper, an overview of aging demographics will be presented, along with perspectives on independence based on a review of the literature. Summaries of theoretical and empirical work related to this concept are included. A discussion follows, including recommendations for future studies on the concept of independence.

Aging demographics

Currently, the United States is experiencing the slowest growth in its history among the older population - those age 65-and-over. That is about to change in the near future. The population of older persons in the United States will undergo dramatic changes in both size and racial and ethnic composition.

Rapid growth in the near future

From 1950 to 1990, the older population grew at an annual rate of 2.3%. For the twenty-year period from 1990 to 2010, growth will dip to 1.3% per year. The fastest growth will be seen from 2010 to 2030, when baby boomers, those born between 1946 and 1964, turn 65 years of age. This will spark a 75% increase in the population of older persons, from 39 million in 2010, to 69 million in 2030. By 2050, there will be 79 million Americans age 65-and-over, representing 20% of the total population of the United States.

The older population is frequently divided into three subgroups: the young-old (65-74), the middle-old (75-84), and the oldest-old (85-and-over). Over the next 50 years, the largest cumulative population increase will be among the oldest-old, making this the fastest growing segment of the U.S. population. By 2050, the number of people in this age group will increase 400%, and comprise 4.6% of the population (18.2 million), compared to 1.4% (3.6 million) in 1995.

This trend is the result of two factors: an increase in the number of people entering the ranks of the older population *and* an increase in their average life expectancy at birth. Currently, average life expectancy at birth for males is 72.5 years.

Once a man reaches age 65, he can expect to live an additional 15.5 years. Females have an average life expectancy at birth of 79.3 years, with an additional 19.2 years if they reach age 65. By 2050, the average life expectancy for males and females will be 80 and 84 years respectively. Men and women who reach 65 will live, on average, for another 20 and 22 years, respectively (Day, 1996).

Shifting racial and ethnic composition

As the population of older persons grows, shifts are expected in racial and ethnic composition as well. Because of the baby boomers, the most dramatic increase will be seen from 2010 to 2030. The percentage of older persons included in Hispanic, Black, Asian/Pacific Islander, American Indian, and Eskimo/Aleut Census Bureau categories is expected to rise. During the same period, a decrease is expected in the White population, declining from 90 to 82%, and a greater decrease in the non-Hispanic White population (85 to 66%). By 2050, 17.5% of the older population will be Hispanic, compared to 4.5% in 1995 (Administration on Aging, 1997).

Characteristics of older American women

Women outnumber men

The majority of older persons in the United States are women, and the percentage by which they outnumber men increases with advancing age. In 1995, there were 45% more older women than men. Among those 85-and-over, there were 158% more women than men. By the year 2050, women 85-and-over will outnumber men in the same age group by more than four million (Day, 1996).

Health

Because of their longer life span, older women are at risk for chronic illness related to heart disease, cancer, stroke, fractures, arthritis and sensory deficits. Mental health concerns include dementia, depression, and alcohol dependence. Many of these diseases that increase health care use or cause death are also major causes of disability for older women (Dimond, Catanzaro, & Lorensen, 1997; Fried, Bandeen-Roche, Kasper, & Guralnik, 1998; LaCroix, Newton, Leveille, & Wallace, 1997).

Marital status/living arrangement

Women age 65-and-over are most likely unmarried, either through widowhood (46%), never having been married (4%) or divorce (7%). Among older persons, widows outnumber widowers because women have greater life expectancy than men, and because women tend to marry older men. Of women 65-and-over, only 36.7% are likely to be married (with a spouse present), compared to 70.6% for men. By age 75, the percentage of women who are married (with a spouse present) drops to 22.3%, while 64.3% of men are still married (with a spouse present). Given these figures, it is not surprising that, when compared to older men, older women are more likely to live alone. The prevalence of women living alone increases with advancing age. There is no indication that this trend will change in the near future (Administration on Aging, 1997).

Economic status

While socioeconomic conditions for older persons have improved overall in the last few decades, they mainly reflect improvements for older couples and single men. For example, the poverty rate for older women in 1997 (13.1%) was higher when compared

to older men (7.0%). Subgroups of older women are more at risk for being poor or near-poor (within 125% of the poverty level).

Racial or ethnic background plays a role in predisposing older women to poverty, most likely due to cumulative disadvantages resulting from racism, sexism, classism and ageism. In 1997, poverty rates for older Black and Hispanic females were 26% and 23.8% respectively, compared to 9% for older, non-Hispanic White females.

Marital status impacts economic status as well. The average American female can expect to spend 15 years as a widow (Smeeding, Estes & Glasse, 1999). Upon becoming widowed, many women face poverty for the first time in their lives. Historically, women have relied on their husband's Social Security work history for income in old age. Once widowed, such payments through 'spouse and dependent benefits' are generally lower and do not support the lifestyle these women enjoyed when their spouse was alive. Current cohorts of older women are unlikely to have their own public or private pension because of unpaid caregiving work, discontinuous work histories, or part-time or low paying jobs (Chater, 1996; Dimond, Catanzaro, & Lorensen, 1997; Stone, 1997).

Women who *live alone* are also likely to be poor or near-poor. In 1997, 21% of older women living alone fell into these categories, compared to a 6% poverty rate for those living with a spouse or family member. While they represent only 58.7% of the older population, women constitute 72.4% of the aged poor (Stone, 1997).

The risk of poverty also rises with *advancing age*. Because median income decreases steadily as age increases, the oldest-old have the highest rates of poverty

among older persons. Women age 85-and-over have the highest rates of poverty in the U.S., at 22.7% overall. Those with a combination of factors (85-and-over, women of color and 'living alone') face the highest poverty rates in the country, reaching 48.3% or more (Hardy, 1988; Moon & Mulvey, 1996).

Independence: A review of the literature

Independence and historical influences

Independence is part of the American dream, a belief system that rewards people for being proud and self-reliant (Butler, 1975). It is such a pervasive part of our culture that some think of independence as a basic part of human nature (Atchley, 1980) or an instinct (Taira, 1988).

Independence is fundamental to the American way of life. In the land of the free and home of the brave, independence is highly valued. According to Rubinstein, Nagy, and Kilbride (1992), independence is "the cultural sanctification of the individual through the ability to control one's personal affairs, legal rights, and moral responsibilities" (p. 3). Choice and control are fundamental attributes of independence. "Without choice and control, there is nothing to be independent about" (p. 7).

The personal meaning of independence may vary with age, sex, race, ethnicity, functional status and living arrangement, as well as political, social and economic conditions. Despite these variations, independence seems to emerge as a primary value. The primacy of independence in American life is reflected in a 1963 statement from the President's Council on Aging:

To most older Americans, a high degree of independence is almost as

valuable as life itself. It is their touchstone for self-respect and dignity. It is the measure they use to decide their importance to others. And, it is their source of strength for helping those around them. (Osterbind, 1972, p. ix)

Americans' fierce desire and drive for independence may reflect characteristics of the early immigrants: the Protestant work ethic, the frontier mentality, and extensive social and geographic mobility (Rubinstein, Nagy, & Kilbride, 1992; Triandis, 1995).

Our literature, folklore, and politics venerate the success of self-made men and women, and in those individual successes, the American people have taken collective pride, for what was possible for one to achieve became a possibility for all. Success was a measure of the person, a testimony to strength and intellect, the reward of the deserving. (Hardy, 1988, p. 311)

Financial independence in old age is seen as a reward for cultivating good qualities in younger years, such as hard work, moderation and foresight. Those who fail to arrive at old age with the necessary resources are often thought of as failures, despite the fact that, for many, poverty (or near-poverty) in old age is the result of social, political, and economic forces beyond their control.

A desire and drive for independence also reflect values held in an industrial society. In an industrial society, independence is closely tied to productivity and paid work. Americans are taught from a very early age to value independence, especially financial independence.

In a culture such as ours which glorifies the do-it-yourselfer, the lone cowboy, the maverick, and the hero-against-the-world, it is difficult to admit to realistic dependency needs without condemning oneself.

Americans have some very unkind names for dependent people - moocher, sponge, leech, bum. (Clark & Anderson, 1967, p. 64)

In the U.S., it is considered the responsibility of an individual to meet their basic needs. Failure to do so will eventually result in assistance from the government, but only at a level that allows bare subsistence. Stigma is usually attached to accepting such support (Robertson, 1999). The issue of dependency has never been easy for Americans to resolve.

Our emphasis on self-sufficiency teaches us that dependency is weakness, and our focus on individualism argues that the cause of that weakness is in ourselves - that the dependency of adults stems from their own poor decisions, their lack of initiative, and the absence of proper planning. That emphasis leads to a discounting of the importance of social and economic structures in the production of dependency, and to the devaluation of the complex networks of interdependency that more accurately reflect the content of our lives. (Hardy, 1988, pp. 311-312)

Independence and cultural influences

Americans' ideas and feelings about independence are also influenced by culture. Individualism and collectivism are continuum-based cultural constructs that describe the relationship of an individual to the collective. Individualism and collectivism are

respectively correlated to independent and *interdependent* views of self (or self-construals).

Those who hold an independent self-construal tend to highlight their separateness, uniqueness, and internal attributes. Such individuals consider their own needs before they consider the needs of their family and community. They see themselves apart from any social context. They hold a belief that people are in charge of their own destiny. Self-worth is reflected by personal achievements.

People with an interdependent self-construal emphasize connectedness, group membership and relationships. The interdependent self considers the needs of the family or community over their own, and believes that their fate or destiny is in the hands of external forces. Self-esteem is enhanced by the ability to 'fit in' and maintain harmonious relationships (Singelis, 1994; Thompson, 1997; Triandis, 1995).

As noted earlier, individualism and collectivism form a continuum, with varying degrees of each found within cultures *and* within individuals (Matsumoto, 1996; Murphy, 1998). Individualism is commonly associated with northern and western Europe, North America and Australia, while collectivism is linked with cultures in Asia, Africa, South America, and the Pacific Islands. The 'majority' culture of the United States is thought to be the most individualistic culture in the world.

Given the high degree of individualism in American culture, it is no surprise that the notion of independence is a driving force in people's behavior. An emphasis on individualism contributes to Americans' concept of freedom.

We define it not as an opportunity to move about and establish newer and

wider relationships with others; rather, in American terms, it amounts to a tendency in us to alienate ourselves from others through a tenacious insistence upon individual rights rather than social relatedness. (Clark & Anderson, 1967, p. 428)

Like individualism and collectivism, independence and dependence can also be considered on a continuum. Lowy (1989) conceptualizes this continuum in the context of one's physical and social environment. People continually make adjustments or adaptations at all stages of life in order to balance independence and dependence.

A classic study by Clark and Anderson (1967) addressed aging as a cultural process that requires adaptation. In an anthropological study of mentally-well and mentally-ill (outpatient and hospitalized) subjects in San Francisco, a subsample from each group was chosen for an intensive interview. Content analysis revealed that independence was the primary personal goal underlying self-esteem, regardless of health status.

The *meaning* of independence, however, was different between mentally-well and mentally-ill subjects. Participants who were 'well' wanted to be independent as a matter of pride, to keep the respect of others. They also wanted to avoid becoming a burden to family and friends. While they agreed that one should call for help if needed, they also expressed the hope that *they* would never be the one to do so. This behavior was characterized as adaptive.

For those who were mentally-ill, the desire for independence was more of a defensive tactic born out of mistrust of others. Independence was a means of avoiding

neglect and ill-treatment by others. This behavior was classified as maladaptive.

Clark and Anderson (1967) also questioned the subsample about sources of high and low morale, or satisfaction and dissatisfaction with life. The primary reason for low morale in both groups was dependency (either financial or physical). Sixty percent of the subsample ranked dependency as the primary source of dissatisfaction with life. The investigators hypothesized that dependency may have ranked so highly because “it may be that independence is such a strongly internalized value that, regardless of social consequences, its loss cannot be tolerated by the individual” (p. 222).

Independence and ability

Physical and cognitive function are often seen as key factors in maintaining independence in older persons. Assessments of functional independence are often based on ability to successfully (independently) perform Activities of Daily Living (ADLs) such as bathing, dressing and eating, and Instrumental Activities of Daily Living (IADLs) such as shopping, managing money and using the telephone. Rowe and Kahn (1998) define independence as:

...continuing to live in one's own home, taking care of oneself, and carrying out the routines of daily life - dressing and washing, housework, shopping, and meal preparation. Especially in the United States, where many people live in single homes, where stores are concentrated in shopping malls, and public transportation is limited, living independently also means driving an automobile. (p. 42)

Full physical and mental function is one of the three main components of

'successful aging,' along with avoiding disease and disability, and continued engagement with life. Atchley (1980) describes independence in a similar way. Conditions necessary for maximizing an older person's choices are financial independence, housing, mobility, social support and mental self-sufficiency. While physical health is ideal, physical function is more important in helping people maintain their independence. Mann, Ottenbacher, Fraas, Tomita, & Granger (1999) define independence as "the ability to take responsibility for one's own performance and desires" (p. 211).

Independence and adaptability

The ability of older people to take care of themselves may vary on a day-to-day basis, fluctuating with the course of chronic illness or disability. Those with declining physical and cognitive function often employ compensatory strategies to maintain their independence. For many, it requires either adaptation *to* the environment or adaptation *of* the environment. When these adaptations fall short, individuals may cope with declining ability by redefining or readjusting their perception of independence.

Whether by better fortune or better choices, Ms. Worth has found avenues of compensation to fill the gaps in her old age resources. When she said, "I don't grieve - I just try," she explained her most successful strategy for surviving dependence. Her ability to adapt to her circumstances, to make the best of a bad situation, usually allows Ms. Worth to have her needs met in ways that preserve her independence. She is, of course, not independent, but her dependence is weighted against that of others less able and redefined as independence of a sort - one no less precious merely

because it is not complete. (Ball & Whittington, 1995, pp. 235-236)

For most Americans, independence is an integral part of their identity, which in turn helps define their role. To be independent is to have power, to be autonomous, to have control over one's life, and to be self-reliant. The resistance a person shows to accepting assistance in meeting basic needs may actually be seen as a *measure* of their self-reliance and independence. (Clark & Anderson, 1967)

Loss of independence results in a diminution or loss of role, especially the identity of being productive and useful. Role loss evokes powerful feelings and emotions, including grief.

...role loss can deprive older people of friends, kin, activities, and sources of social status. Older people who experience such losses often find themselves in the position of having to ask for help from people they do not know, from agents of bureaucratic organizations who are not interested in what the older person may have to *give* in order to preserve self-respect. The significant question is just how much independence older people have, and how much they are forced to give up. (Atchley, 1980, p. 233)

If older people are successful in creating an alternate role-identity to that of dependent, disabled, and needy, then they can hold on to an acceptable self-concept. Some fear the loss of independence so much that they renegotiate or redefine its meaning - a strategy called 'impression management' (Ball & Whittington, 1995). In a differing view, Rubinstein, Nagy, & Kilbride (1992) contend that a frail older person's claim of

independence, in the face of obvious physical, social and environmental challenges, represents some measure of 'false consciousness.'

Miss Mary soon intends to move into her eldest daughter's house due to her difficulty in climbing stairs and doing housework. She did not mention her grief at leaving the home in which she was born and raised, raised her own children, and believes the spirits of her relatives still dwell. Instead, she sees her life as planned and the situations in which she finds herself as serving a purpose not immediately apparent to her. Indeed, even though she is physically debilitated, she describes herself as independent and assesses her situation realistically and humorously. (Black & Rubinstein, 2000, p. 129)

Given the prevalence of chronic illness among older persons, complete independence may not be a realistic goal, especially with advancing age. Such a goal creates a dilemma for many who see independence as the ideal, with anything less being a blow to their self-image, self-esteem, and self-respect. Nonetheless, dependence, or interdependence, may be a more realistic goal.

The overemphasis - particularly in our culture - on being independent will only lead to disillusionment and frustration and to an emotional and mental disequilibrium, as all of us (white and nonwhite; male and female; young and old; Jew and Gentile) are dependent on one another in many spheres of life at any age, at any time and at any place. (Lowy, 1989, p. 143)

Independence and living arrangement

In many articles written about the independence of community-dwelling older Americans, it is implied that independence is the ability to live alone (Markson, 1997; McGarry & Schoeni, 1998; Schank & Lough, 1989; Smits & Kee, 1992; Taira, 1988). Living arrangement frequently serves as a proxy for independence.

Notions of independence and home are tightly connected in American life. In Why survive? Being old in America, Butler (1975) describes the meaning and importance of home for older persons:

The place where one lives is often profoundly connected with who one is and how one expresses this sense of self. Home is where all individuals feel most comfortable to be themselves, to drop social facades. Many older people also associate home with autonomy and control. For them it is sometimes the only place where they can feel certain of their surroundings, free from the control and restraints of others. Home is an expression of one's personality through furnishings, decorations, memorabilia, ambience, plants, pets. It is a familiar place in what may be a changing and unsteady outer world. Ties to the past are maintained through personal possessions, household routines learned and carried out through the years, and through the memories surrounding these very personal expressions of one's self and the selves of family and friends. For an older person to have a home of his or her own is to have the opportunity to socialize, to give and receive invitations, to have privacy

with chosen companions and to be alone when this is desired. (p. 103)

Living in one's own home provides a sense of control over one's surroundings.

Being with familiar objects and people contributes to a sense of well-being. In describing their study sample, Ball and Whittington (1995) note:

The homes of the old people (in this book) may not always be safe, comfortable, or convenient, but for each person, remaining in these familiar settings is a primary value. Staying at home enables them to retain some of the control that seems to slip away so quickly with dependence. (p. 19)

For others, being in one's own home is important because of the choices and the protections that it affords.

Mrs. Cummings' independence (also) asserts itself by her self-imposed isolation. Mrs. Cummings' alienation from neighbors keeps her from being judged by them. In this, she protects her reputation from real or imagined criticism. (Black & Rubinstein, 2000, p. 116)

Home ownership plays an important role in continuing an older person's preretirement identity, an important aspect of adaptation to aging. For those who own their own homes, property ownership enhances the sense of independence through the financial security it may afford, especially if there is equity in the home (Rosow, 1974). Home ownership is only of benefit, however, if there are adequate resources for repairs, utilities and taxes.

Morrissey (1998) conducted a longitudinal study of 15 women, age 76-and-older,

living alone in a Midwestern city. The purpose of the study was to identify resources and characteristics of older women who are able to live alone. Using reminiscence to explore the women's value systems, *independence* was the most frequently recurring theme, "evidenced by participants' determination to remain in their own homes" (p. 415). Continuing to live in their own homes was related to the 'good life' and quality of life.

Independence and resources

Wan, Odell & Lewis (1982) conceptualized a framework for promoting the well-being of older persons. Their model is a Venn diagram which shows the interrelationship of *social*, *mental* and *physical* well-being as components of *general* well-being. Indicators of social well-being are social support, social activity, living arrangement, economic well-being and a sense of environmental well-being. Resources for psychological well-being are assessed by symptoms, self-report, and life satisfaction. Physical well-being is indicated by level of disability and impairment, functional dependency, self-assessed physical health and nutritional status. Contributors to independence are found in all three components of general well-being.

As noted above, social support is an important component of well-being, and a resource for independence (Arling & McAuley, 1984; Mancini, 1984; Wan, Odell & Lewis, 1982). According to Rubinstein (1984), 'successful' independent aging for those who live alone depends on the strength of a person's informal support network. For those who live alone, independence may be possible because of day-to-day interactions with a support network. For others, independence is possible because a network is in place, but only called upon in times of crisis. During such times, a person's ability to remain

independent is a function of how well the network responds.

For those in the formal care system, it is important to hold onto a vestige of independence, even though the client role brings the stigma of being dependent. The more that older people are able to assert their power and control in this relationship, the less dependent they feel.

Reciprocity is an important factor in supporting an older person's sense of independence. For some, independence is not only the ability to be self-reliant, but to engage in reciprocal relationships based on "mutual respect, responsibility, and trust" (Atchley, 1980, p. 230). Some older people need to adapt to the idea of receiving help. Those who learned to rely on relatives and neighbors when they were younger do not find it as difficult as it is for those without this experience. Those who find it difficult try to mitigate negative emotions associated with accepting help by exchanging resources with the person providing the assistance.

Money is a resource for independence, but only for some. In interviews with poor and nonpoor older women, Black and Rubinstein (2000) noted that almost all of the women described themselves as independent, and that independence was of supreme importance. The nonpoor women in the study saw money as a means to reach independence. Poor women, however, did not usually equate money with independence; independence was more related to the ability to choose.

Making choices within the boundaries of poverty was the cornerstone of independence. If going without or getting into debt were the perceived alternatives, depriving oneself of a small or large pleasure seemed not

only the sensible choice, but one that gave women an internal locus of control. (p. 86)

Thus, those who have little to bargain sometimes choose to go without rather than depend on people's charity. At times, nonmonetary resources, such as interpersonal skills or personal accomplishments, help in maintaining a sense of power and control.

Reminiscing about past successes, such as "being a good wife or mother," or "being a dedicated employee," or "never asking anybody for help," remained ... a well-traveled route toward maintaining independence and self-esteem in the present. (Black & Rubinstein, 2000, p. 118)

Life experience and time are additional resources used by older persons in adapting to challenging personal and environmental conditions. Life experience includes not only skills such as cooking and money management, but experience with adversity, which strengthens psychological and social resources (Ball & Whittington, 1995).

Faith in a Higher Power also plays a role in the subjective and objective experience of independence as older persons negotiate the challenges of life. In speaking of spirituality as a resource for older women living in poverty, Black and Rubinstein (2000) note:

Although most poor women used their faith both as a way of viewing themselves and others and as a way of adapting to the harshness of the world, they did *not* use it as an opiate for passivity and submission.

Women did not construe their relationship with God as an entitlement to an easier life, but as a route toward heightened independence and self-

reliance. (p.10)

Models of independence

A literature search yielded one theoretical model of independence as it relates to older, institutionalized adults. Bowsher (1994) developed a model of independence in relation to nursing home residents in response to the dependence-oriented care given in long-term care facilities, despite residents' desire for independence. The model is based on Rotter's social learning theory, a motivational theory where the "potential for a behavior to occur within a specific psychological situation is a function of the value of the reinforcement to the person and the person's expectancy that the behavior will elicit the valued reinforcement in that specific situation" (Bowsher, 1994, p. 212). In simpler terms, a person's motivation for behaving in a particular way is determined by the value they place on a certain outcome and the degree to which they expect their behavior will secure that outcome.

According to the theory, there are two types of expectations: generalized and situational. Generalized expectancy usually occurs in new or uncertain situations, where the person doesn't know what to expect. Situations that are more routine or familiar to the person lead them to expect certain events or outcomes. The person decides which type of expectancy to use based on their perception of what is happening, usually through cues in the environment.

Components of Bowsher's model of independence include *behavioral competence, psychological well-being, sociodemographics, and subjective and objective environment*. Behavioral competence variables include physical health, functional health,

cognitive health, time use and social health. Based on the literature, Bowsher (1994) believes that nursing facility residents desire competence in all of these areas.

An assumption of the model is that behavioral competence is a key variable in the process of independence, since a decline in behavioral competence often leads to dependence. This, in turn, leads to nursing facility admission, lower quality of life, and a decline in well-being. The model suggests that situational expectancy mediates the relationship between behavioral competence variables and psychological well-being. Bowsher asserts that the trajectory of decline into dependence may be affected by interventions that will change the dependent-oriented care given in nursing facilities. The author notes that the model only applies to cognitively intact residents and that further validation of the model and its components are needed.

A fundamental criticism of this model is that Bowsher (1994) fails to define independence, other than to imply that it is a lack of dependency. Other criticism, offered by Abrams (1994), is that the model is deficient because it locates the problem within the individual. Any solution would, therefore, require psychological and functional adjustments on the part of the resident, while ignoring social and political forces that lead to dependence-oriented institutionalized care.

Abrams (1994) also questions the assumption that desired independence of institutionalized residents is a good or desirable outcome. She notes that across age cohorts, ethnic groups, or social classes, there is no such consensus in the literature. Lastly, she questions the relevance of the concept of 'expectancy of control' in a nursing facility setting, adding that this may be an inappropriate or unreachable standard.

A second model of independence is found in the social gerontology literature and is not specific to older adults. In this model, independence is defined as “self-perceived and actual behavioral and psychological individuality” (Chibucos, 1984, p. 244).

Interconnectedness refers to interactions with loved ones, friends or acquaintances, both intra- and extra-familial.

The model illustrates that independence is a lifelong process of simultaneously being pushed and pulled toward independence and interdependence. Key people assist during various stages in this process. Assumptions of the model include the assertion that there is a clear place for children in the lives of older persons; there are various levels of influence at different points in the life-span; and independence is of equal importance at every phase. It is also assumed that healthy and healthful independence is attained or maintained through successful interconnectedness (Chibucos, 1984).

Empirical analyses of independence

In 1991, O’Bryant published results of a study measuring the degree of self-sufficiency of older widows in a Midwestern city/county area. Self-sufficiency, especially financial self-sufficiency, was seen as a prerequisite for independence, or being an independent person. Independence was defined as “the ability to manage one’s own decision-making, finances, mobility, household, and personal needs without depending upon assistance from others” (p. 42). The investigator hypothesized that “being an independent, self-sufficient person would provide the older widow with a sense of accomplishment, thereby increasing her psychological well-being and life satisfaction” (p.42).

Each woman was individually interviewed in her own home. The interviews were conducted by middle-aged women who were trained in the standardized interview procedure, which consisted of several open-ended questions, psychometric scales, and structured items. Independent variables included sociodemographic characteristics, overall self-sufficiency, male-task self-sufficiency and female-task self-sufficiency. Psychological well-being was measured using Bradburn's Affect Balance Scale (subscales for positive and negative affect; reflection of happiness and unhappiness). Life satisfaction was measured on a 7-point Likert scale developed by Andrews and Withey.

Three regression analyses were conducted, using measures of psychological well-being (positive and negative affect) and life satisfaction as dependent variables. The hypotheses were not supported. *Health* and *living alone* were significant predictors of positive affect. *Health*, *income* and *age* were significant predictors of negative affect. *Health* was the only significant predictor of life satisfaction.

Post hoc analysis was done to determine predictors of male-, female- and overall task self-sufficiency. Male-task self-sufficiency was predicted by *income*, *years of employment*, and *living alone*. Female-task self-sufficiency was determined most significantly by *health*, *years of education*, and *years of employment*. The only variable that predicted overall self-sufficiency was *years of education*, lending support to the notion that future cohorts of women may have more role flexibility in older age.

O'Bryant (1991) concluded that self-sufficiency - independence - does not necessarily make the lives of older widows better, and may negatively affect well-being through social isolation, loneliness, and depression. She summarized by saying:

...a society that over-values independence may unwittingly create pressure on its elderly to be too independent, which may be unfortunate. In an ideal society, older persons and their support systems would work toward a viable exchange of services, so that interdependence would become the most valued lifestyle. (p. 50)

Brown, McWilliam and Mai (1997) used a focus group method to determine barriers and facilitator to seniors' independence. Four themes emerged as facilitators and barriers to the independence of seniors: attitudes and attributes, service accessibility, communication and coordination, and continuity of care. No working definition of independence is provided, making it difficult to interpret the results.

Lastly, White and Groves (1997) explored the concept of independence through content analysis of 78 interviews of older persons in Queensland, Australia. Two themes that emerged as important to maintenance of independence were 1) the ability to mediate and control received assistance, and 2) the ability to reciprocate. Interdependence is therefore seen as an important component of maintaining independence.

Social programs and older women: Independence for all?

Over the past century, various social programs have arisen in the U.S. with the intent of helping older Americans maintain their independence. Some of these policies are the result of living in an industrial society. In the early 1900s, older workers were often forced into retirement to make room for younger, more productive workers. Forced retirement segregated older people, and encouraged and reinforced their disengagement from society (Lynott & Lynott, 1996). It also left millions with little to no means of

subsistence. In 1935, the Social Security Act was signed into law, which provided displaced workers (and their families) with income.

Medicare and Medicaid were enacted in 1965 as Title XVIII and Title XIX of the Social Security Act. Medicare, a federal program, was primarily intended to guarantee access to mainstream health care for older Americans, while safeguarding them from catastrophic financial losses associated with major acute illness episodes. Medicaid, a federal-state matching entitlement program, was designed to provide health care to the poor, but soon became a major funding mechanism for long-term institutionalized care of older persons (Estes, 1979).

In 1965, the Older Americans Act (OAA) was passed as part of President Johnson's *Great Society* legislation. The OAA provided federal funding for planning and coordination of social and recreational activities for older persons. Reauthorization of this Act in 1981 emphasized provision of supportive services to help older persons remain independent in the community (U.S. Code, 1999).

According to Estes (1979), however, programs born out of the OAA actually isolated older persons from other age groups and indeed, the American mainstream. Instead of fostering the ability of older persons to be financially solvent and self-managing, the OAA did nothing more than spawn the 'aging enterprise,' a plethora of industries that profited from presenting aging as a problem. Legions of 'experts' sprang onto the scene to help age-segregated older persons with their socially constructed dependency.

The creation of dependency reflects the ageism in our society. Our old age

policies have attempted to compensate for the negative effects of growing old, even though many of those negative effects grew from our own decisions to limit economic access - formally and informally - on the basis of age. (Hardy, 1988, p. 318)

Eventually, the view of 'aging as a problem' was raised to the level of 'aging as a crisis,' one that could only be solved through a massive infusion of services (Estes, 1979). Older people were conceptualized, for the benefit of the service industry, as a homogeneous mass of needy and dependent people. Americans' highly-prized individualism lent itself handily to this concept, making each person responsible for their own plight. This served to divert attention away from political and social factors that had created, and were perpetuating, this biased, dependent view of older persons.

In summary, at the same time the federal government sponsored programs to encourage independence, they created actual or perceived dependence.

...a pervasive and powerful American ideology sets the aged apart from the rest of society as a group with needs that require special policies and programs. The adoption of this ideology has been deemed necessary by the most sincere advocates for the aged, but its application has been at the expense of the aged themselves. This approach institutionalizes and reinforces the marginality of the aged by legitimating an industry of agencies, providers, and planners that must then continually reaffirm the outgroup status of the aged in order to maintain and expand their own activities. These special policies and programs segregate and stigmatize

the aged, although theoretically they exist for the purpose of securing for the elderly a fair share of available resources. (Estes, 1979, p. 17)

Unfortunately, one-size-fits-all social policies do not provide equally for their intended beneficiaries. For some segments of the population, public and private programs do not offset lifelong disadvantages caused by the effects of racism, classism, sexism, ageism, and poverty (Crawley, 1988; Dimond, 1997; Moon & Mulvey, 1996; Stone, 1997). In essence, they do not provide differentially for those at higher risk.

Summary

If the goal of public and private programs is independence for older Americans, and the ability to be independent depends on social and personal resources, then perhaps not all beneficiaries have an equal chance of realizing that goal. Given the increased risk of chronic illness, disability, and poverty faced by older women in the U.S., are older women more at risk for loss of (or less) independence than older men? Are there subgroups of older women, based on factors such as age, marital status, race, ethnicity, living arrangement or income, who are more at risk for loss of (or less) independence? Before these questions can be answered, the meaning of independence must be clarified.

Review of the literature suggests that independence is not a dichotomous concept, but one that exists on a continuum with interdependence and dependence. Independence is a dynamic process, in that perceptions or degrees of independence may vary between and within individuals over time. The degree of independence one feels or perceives may be relative, as people may assess their independence compared to others. There may be differences between actual and perceived independence. The subjective and objective

experience of independence may also be different.

It cannot be assumed that independence is a desired or appropriate goal for all older persons. Cultural expectations may call for high levels of interdependence, rather than independence. In some cases, individuals who meet societal expectations for being independent (living alone) suffer from loneliness, isolation and depression. They may also avoid or refuse needed help. Lastly, a desire for independence does not necessarily indicate a desire for living alone.

Regardless of these issues, there is reason to believe that there are certain attributes common to independence. Based on the literature review, physical, cognitive, psychological, social, spiritual and economic resources most likely impact the degree of independence experienced by the individual. The presence, absence or mix of these attributes may predispose individuals to more or less independence.

Why, then, should we be interested in the concept of independence as it relates to older, community-dwelling persons in the U.S.? Perhaps because we can no longer assume its meaning across individuals, its value across cultures (Kamitani, 1996; LinOu, 2000; Thompson, 1997), or its appropriateness as a goal for all. Or, maybe we should be interested in this concept because socially constructed expectations for independence, like the socially constructed dependence described by Estes (1979), are fueling a 21st Century aging enterprise. The primacy of independence continues to drive political, social and economic agendas.

The time has come for us to reexamine our thinking about independence. In earlier political, social and historical settings, independence was valuable as a motivator,

a goal, and a celebration of freedom from tyranny. Over time, Americans have been encouraged to pursue maximum independence, whether actual or perceived, in almost all aspects of life. But in reality, none of us are truly independent. From survival to self-actualization, life in today's world is enhanced by the ability to be interdependent - to share human, material and energy resources so that greater numbers may thrive and prosper.

Current notions about independence and older persons are outdated and potentially harmful. Expectations about independence may be unrealistic and narrow, locating the problem (dependence) or responsibility (independence) in the individual instead of in political, economic and social institutions. For those who only see themselves in the dichotomy of independence and dependence, with its respective relationship to success and failure, loss of real or perceived independence leaves the individual with only one other state of being. Crossing the invisible threshold into real or perceived dependence may leave older persons feeling depressed, incompetent, hopeless, and lonely.

Our view of independence and older persons needs to be reconceptualized, much like ideas about *health* have advanced beyond *absence of illness or disease* (Allen, 1986; Keller, 1981; Tripp-Reimer, 1984; Smith, 1981). A conceptual critique serves to make explicit values and assumptions about independence in the older population and to challenge those values and assumptions. Many may be served by broadening our thinking about independence beyond living arrangement, financial status, functional ability, or use of means tested entitlement programs.

Exploration of the concept and development of a model of independence are initial steps toward building a theoretical base for social policy decisions. Various research methods may be used as tools with which to explore this concept, such as interviews, focus groups, discourse analysis, factor analysis and structural equation modeling.

Chapter 3

Analysis of existing data sets in nursing research

Introduction

Secondary analysis of existing data sets is a research method by which nurse researchers can explore interesting questions. Secondary data sets are increasingly popular for several reasons: data sets are more available and more user-friendly through advances in technology; there is high yield from a relatively small investment; and, health educators are discovering the value of using existing data sets in nursing research courses, especially in areas where adequate numbers of participants are difficult to recruit (Ailinger, Lasus, & Choi, 1997; McArt & McDougal, 1985).

In this paper, an overview of secondary analysis is followed by methodological considerations in the study of older adults. This prepares the reader for a discussion of the process of selecting and using existing data sets, and a case study in which an existing data set was used to explore nursing research questions related to the independence of older, community-dwelling U.S. residents.

Secondary Analysis

Description

Secondary analysis is the analysis of raw data collected by others. It includes examination of variables (or combinations of variables) in ways other than originally examined; investigation of relationships among subgroups; exploration of data using a new unit of analysis; or, analysis using different statistical methods than were originally employed (Jacobson, Hamilton, & Galloway, 1993; McArt & McDougal, 1985; Polit &

Hungler, 1995).

A major source of secondary data are data sets that are collected primarily for research purposes. Such data are typically available in two ways. In the course of doing a study, more data may be collected than needed to answer the primary question(s). Extra data are often used to answer secondary questions in a program of research, or made available to colleagues or students for further analysis. Large data sets are also available through government, university and private organizations for the purpose of providing large, representative samples for study (Jacobson, Hamilton, & Galloway, 1993).

Additional sources of secondary data, referred to as nonresearch-oriented secondary data (Shi, 1997), include legal and political documents; newspaper and media accounts; institutional, commercial and industrial records; historical and personal documents; records of governmental proceedings and statistical reports; and organizational records, such as clinic and billing records, meeting minutes and annual reports (Brown & Semradek, 1992).

Advantages of Secondary Analysis

There are many advantages to the use of existing data sets. In times of restricted funding and stringent quality standards for research, use of secondary data obviates the need to collect original data, thereby saving time, money and resources. It also enables the researcher to work with sample sizes that might not be possible to obtain, allowing more choice in statistical tests, increased statistical power, narrower confidence intervals, and increased generalizability of the findings. Because larger studies often have the resources to train and monitor interviewers, data are collected by workers with

standardized skills, thereby increasing reliability (Brown & Semradek, 1992; Jacobson, Hamilton, & Galloway, 1993).

Limitations of Secondary Analysis

Several general concerns have been raised about the quality of existing data available for secondary analysis. Wolinsky (1994) notes that data on health services utilization by older adults are lacking in depth and breadth. Often, data sets contain insufficient indicators or measures of underlying constructs. In addition, cross-sectional studies provide only a snapshot, doing little to illuminate the course of health behaviors over time. Lastly, important antecedents of health behavior, such as spirituality or health beliefs, are missing from health-related data sets.

Secondary researchers who choose to use vital statistics data should be careful when interpreting the results. There are state-by-state differences in the way vital statistics information is collected, and the accuracy with which it is recorded. Birth and death certificates are not standardized. Mortality data are particularly problematic, as they are frequently inaccurate or incomplete with regard to race, occupation, age, place of residence, and cause of death. In addition, regional diagnostic idiosyncrasies and changing diagnostic criteria complicate identification of trends in mortality data (Gordis, 1996).

Researchers should remember that information, especially when collected in arbitrary divisions such as census tract boundaries, may be driven by political, economic or social agendas. Also, in order to collect information on variables such as race or ethnicity, decisions were made about how people would be categorized. Such decisions

are often criticized, not only for the methods used, but for the fact that they are collected at all (Brown & Semradek, 1992; Wolinsky, 1994).

Krieger (1992) is critical of data collected primarily by government sources, primarily because of the omission of variables that may reflect social class.

At issue is the routine omission of social class data from most data sources such as national vital statistics, disease registries, hospital records, and even individual studies, along with the persistent treatment of 'race' and 'sex' as essentially biological variables, their consistent conflation with ethnicity and gender, and the pervasive silence about the social realities of class inequalities, racism, and sexism. (p. 412)

Decisions to exclude data about social class are political decisions that keep researchers from examining social determinants of health and disease (Krieger & Fee, 1993, p. 73).

Perhaps the biggest limitation for investigators using secondary data is that they were not involved with original research decisions and processes. Without this involvement, the secondary researcher does not have a feel for hidden factors that may introduce bias, or cause difficulty or error in interpretation. If a deficiency or problem is identified by the secondary researcher, there is nothing that can be done to change it. The secondary researcher is 'stuck' with any differences, errors or omissions in the original study design (Wolinsky, 1994).

Because of this, researchers using existing data sets are advised to spend a great deal of time up front learning how the sample was chosen and how data were collected and processed. Errors or inconsistencies may be introduced at any point during the

research process. During the original data entry or filing stage, errors may be introduced when data are manipulated or fixed.

The secondary user should be aware of any procedures used to correct or clean data (Brown & Semradek, 1992). In assessing whether or not this has been done correctly, Mainous & Hueston (1997) suggest examining data sets for values that are out-of-range or not possible, checking data against known standards, values or relationships, and making sure that all desired data are in usable format for secondary analysis.

The researcher who uses secondary data should obtain original data collection forms and scrutinize them for reliability and validity. Questions should be asked about the training, competence and experience of the original data collectors. Inconsistencies or errors in data collection are of great concern. It is particularly problematic when important variables have been collected in units of analysis that are unusable and cannot be changed (Brown & Semradek, 1992; McArt & McDougal, 1985).

Certain problems are specific to survey data. Meanings of words or phrases change over time, creating differences in interpretation or response to the same questions that are asked over time. In repeated sampling, error may be introduced because of changes in concepts over time, or because variables that are indicators of the concept may change.

Bias may also be introduced because self-reports of health conditions are not verified by a clinician, and some respondents may underreport or overreport, based on stigma associated with certain conditions, social desirability, or who else may be present at the time of the interview (Brown & Semradek, 1992). Some surveys accept proxy

answers from household members who are able and present for the interview. Response bias may be introduced by proxy responders. Differences in interviewer style and technique may also introduce bias.

Methodological considerations in the study of older adults

In addition to previously noted considerations in the use of existing data sets, there are issues to keep in mind when using them to analyze data from older adults. The first issue concerns the representativeness of the sample. Many noninstitutionalized, older participants are recruited from community or retirement organizations. This may introduce self-selection bias. Since some surveys do not include data from institutionalized older adults, significant information about the older population, especially women, may not be available.

Data taken from social service or health care agencies provide an equally biased view of issues under study, again because of selection bias. Such data may only provide a view of those with declining function. Care should also be exercised in interpreting data of institutionalized older men, as they may be sicker than their female counterparts.

While nursing home residents are generally less healthy and closer to death than are the community-dwelling older adults, older women living in institutions are likely to have less severe forms and levels of health problems than do older men in institutions because community-dwelling men are more likely to be living with wives and able to delay institutionalization even in the face of serious physical and mental health problems. (Herzog, 1989, p. 133)

Data from older persons are sometimes biased because of nonresponse, or inaccurate responses received from cognitively impaired adults. Words or phrases may have different meaning to older people than younger. If study participants are asked to provide information from a long time ago, recall bias may be a factor. Lastly, there may be differences in how older men and women self-report health or economic conditions because of social desirability.

Longitudinal studies of older persons are plagued by problems of attrition and mortality. In studying this population, there may not be enough follow up time to make conclusions about the influence of certain factors. Even with good follow up, findings over long periods of time may not be generalizable because of age effects or cohort effects (Herzog, 1989; Schaie, 1988). According to Gee and Kimball (1987), age effects are likely to introduce bias into the results because of experiential or maturational differences. Subjects' responses may change over time, a result of reflecting differently on some of the issues under study. Cohort effects may be behaviors or attitudes specific to a group of people born during a certain era. It is sometimes difficult to decide if observed differences are due to age or cohort effects.

A process for using existing data sets

Conceptual basis

There are many factors to consider when selecting an existing data set for secondary analysis. From defining a target population to qualifications of research team members, many steps are similar to those used to plan the collection of raw data (Jacobson, Hamilton, & Galloway, 1993). Of primary importance is the development of a

solid conceptual background upon which to base developing research questions.

In the usual research process, the question drives the methods. In secondary analysis, the researcher approaches the data with a question in mind, but must examine the data set to see what questions are answerable, and what methods and statistics may be employed (Shi, 1997). Some flexibility in the development of the research question may be required at this point, but the original intent of the secondary analysis should not be compromised.

Human subjects protections

Patient consent is obtained before collection of original data. Specific human subjects protections from the original study are often included in documentation provided with the data set. If all patient identifiers are removed before data are made available for secondary analysis, then the secondary investigator does not need to obtain direct consent from those surveyed. If, however, patient identifiers (or links to identifiers) are available in the data set, additional consent may need to be obtained.

Resources

The researcher who uses a large existing data set needs adequate resources, including skills, equipment and time. Considerable computer experience, including use of statistical software and syntax, will make the project more manageable. For the novice secondary researcher, successful completion of a big project depends on frequent and easy access to an advisor or consultant who is familiar with the approach to large data sets.

Appointments with a statistical consultant should be made early and often. The

advice of a statistician is crucial if complex analyses are planned. Successful completion may also depend on guidance from colleagues who have analyzed secondary data, or conferencing with researchers who have used a particular data set in their research.

Depending on the size of the data set, computer capability ranging from a personal computer to a mainframe may be needed. If a personal computer is used, a large hard drive, hi-capacity RAM and fast microprocessor are needed to handle not only the large amount of data, but complex statistical tests required during the analysis. A high-speed Internet connection should be considered if the investigator plans on using the World Wide Web to search for a data set, or for downloading data or documentation files. The appropriate statistical software and adequate office supplies must also be available.

Lastly, adequate time must be allocated for the project. The amount of time needed to select, explore, prepare and analyze the data is much longer than one might first imagine. Computer hardware and software difficulties, as well as establishing a learning curve when new skills are needed, add additional time to the project. A very conservative time line should be considered, especially for the novice.

Selecting a data set

Data sets may be found in several ways. In the U.S., the federal government collects and stores population data related to many areas, including demographics, vital statistics and health. Primary sources of data are the Bureau of the Census and the National Center for Health Statistics (NCHS). Other government agencies, such as the National Institutes of Health (NIH), the Agency for Healthcare Research and Quality

(AHRQ), the Centers for Disease Control (CDC) and the Health Care Financing Agency (HCFA) fund, collect and store large data bases. Data sets containing information about specific populations, such as older persons, are often found through agencies whose primary mission is to serve those populations, such as the National Institute on Aging (NIA) and the National Archive of Computerized Data on Aging (NACDA). University social science archives are another important source of data for health researchers. The Interuniversity Consortium for Political and Social Research is a network of university databases that makes data available for researchers (Brown & Semradek, 1992).

Data sets may be ordered on CD-ROM, machine-readable tapes, or downloaded from the Internet. Documentation that comes with the data set usually contains information about data format, missing data, and variance estimation. Copies of instruments and details about methods are also available, especially through on-line sources. Questions not addressed in accompanying documentation may be answered by directing questions to personnel who work for the agency supplying the data.

If a data set is not in the public domain, permission needs to be obtained from the original investigator or the agency that owns the data. Before such data may be used, agreements must be secured about what data may be used, how it may be used, how it should be cited in reports, and rules about co-authorship (McArt & McDougal, 1985).

Evaluating a data set for possible use

Existing data sets often contain large numbers of cases and variables. This can delude the novice researcher into thinking that all of the data are usable. Critical examination of the data set for suitability in answering particular research questions

takes a considerable investment of time and resources before a decision can be made about using the dataset for the final analysis.

It is essential that an investigator contemplating secondary analysis critically evaluate several aspects of an existing data set before deciding to use it in a research study. The most important step is careful review of the study design, variance estimation and data collection methods. This information should be obtained early in the process. Special attention should be given to sampling designs or data collection procedures that introduce unacceptable bias into the proposed secondary analysis.

Another key issue is whether or not the study sample reflects the target population for the secondary study, and whether sufficient sample size, especially for subgroup analysis, is present. The size and demographic characteristics of the sample, along with a review of inclusion and exclusion criteria, provide information to help with these decisions.

The secondary researcher needs to pay particular attention to the definition of variables (as defined at the time of the study) and the use of words or phrases on instruments, and decide if those are acceptable for the current study. Review of any important historical or social events that occurred during the original data collection will help account for historical bias.

Exploring a potential data set

After a potential data set has been found, the computerized documentation files should be printed, reviewed and placed in a notebook for future reference. The code book should also be printed out. This is a considerable investment in time and supplies,

but an indispensable resource when working with the data.

The next step is to read the data (usually in ASCII format) into the statistical software package of choice. Care should be taken during this process. Frequency counts on variables chosen randomly throughout the data set can assist the researcher in verifying that the data were read in correctly.

The number of variables in a large data set may be quite overwhelming at first. One way to familiarize oneself with the questions and patterns within the data set is to write syntax that names all the variables. When variables are first-read into the spreadsheet, variable columns have numbered labels which correspond to assigned numbers in the code book. Variable names are associated with these numbers. Having variable names to work with (instead of numbers) makes navigation of the data set much easier.

Once these housekeeping tasks have been accomplished, evaluation focuses on variables of interest. These include variables related to sample characteristics, research methods and analysis. Frequencies should be run to identify the type of data (categorical or interval level), range of answers (including don't know, refused, not applicable), missing data, presence of outliers and possible errors in data entry. Some variables may be checked for accuracy by comparison against known standards or estimates. Issues or concerns raised at this time should be logged into a notebook for future reference.

Checks should be made to insure that key variables meet the assumptions for statistical tests that will be used in the final analysis. Data that do not meet statistical assumptions may sometimes be salvaged by recodes (if appropriate), treatment of

outliers, or data transformations, but these potential corrections should be verified if a decision to use the data set rests on these variables.

If variables are eliminated based on descriptive statistics, a decision needs to be made about whether or not the data set can be used for the final analysis. In some cases, the loss of certain variables may only introduce a limitation to the findings. In other cases, there may not be enough key variables to answer the research question(s). Failure to verify the existence of a sufficient number of usable variables of interest *early* in the process may result in a disappointing realization, after the investment of huge amounts of time, resources and energy, that remaining data are neither acceptable nor appropriate for analysis.

Preparation of the data for analysis

Once a decision has been made that there are enough of the right variables for the final analysis, further preparation of variables may be necessary. Some continuous variables may need to be recoded into categorical variables. Sometimes, the agency that provided the data has already done these recodes. However, some categorizations may not be useful to the secondary researcher and data may need to be recoded into categories more useful for the current study.

Some variables may need reverse coding. Answers may also require recoding to user-defined missing if numeric values assigned to answers such as 'don't know', 'not applicable' and 'refused' will interfere with calculation of tests. When a series of related dichotomous variables are present, scores may be computed that are more useful for statistical analysis.

Once a decision has been made to retain certain variables, and they have been appropriately treated, syntax can be used to read them into a new file. Smaller data files increase ease of handling and decrease processing time.

Analysis of the data

After the data have been prepared, the analysis phase can begin. While the aforementioned tasks are time-consuming, a long process still lies ahead. Management of a large data set requires an organized, well-documented, methodical approach. A notebook should be kept with important output, filed in chronological order, along with notes about rules or decisions made during the course of the analysis and notes taken during meetings or consultations. Syntax also serves as a record of the course of the analysis. Comments inserted into syntax or output files are valuable for future reference.

Over time, many, many computer files are generated. Organization of these files, along with a consistent scheme for naming the files, is important. Regular *backup* of computer files is imperative.

If a portion of the sample is to be set aside for cross-validation of a model, a filter variable can be created that will randomly set aside the requested percentage of cases. Although a random split of a large sample should yield similar groups, tests of difference on key variables will show any significant differences that may factor into possible explanations of results.

Case study: Exploring the concept of independence in older,
community-dwelling adults using factor analysis of a public-use data set

Conceptual basis

The meaning of 'independence' as it relates to older, community-dwelling adults is often assumed in American life. Assumptions are that independence is a goal for all older Americans, and that they are alike in their desire for and understanding of independence in old age. Independence is often used synonymously with living alone. Those who are not independent are thought of as dependent.

Review of the literature suggests that independence is not a static, dichotomous state, but rather one that exists on a dynamic continuum with interdependence and dependence. Furthermore, perceptions or degrees of independence are fluid, varying between and within individuals over time. Historical, cultural, economic, and social factors, as well as physical and cognitive factors, may affect actual or perceived independence. Lastly, independence may be dependent on the ability to access resources.

Based on this conceptual background, a research proposal was developed to explore factors common to the concept of independence in older, community-dwelling U.S. residents. A public-use data set, the Second Supplement on Aging, (NCHS, 1998) was chosen for exploratory factor analysis. Based on a preliminary model of independence, data were further analyzed to investigate whether older, community-dwelling women are more at risk for loss of (or less) independence than men, and in particular, if subgroups of women are more (or less) at risk for loss of independence based on age, marital status, race, ethnicity, living arrangement or income (Baker, 2000).

Human subjects protections

NCHS is bound by moral and legal obligation to guarantee protection of all

personal information provided by respondents. Participation in the study was strictly voluntary, and consent was signed before the original data collection. There are no means by which to identify subjects in the data file. Secondary analysis of these data for the current study qualified for exemption from human subjects review through the University of Washington Human Subjects Division.

Resources

The investigator had substantial experience in handling data in SPSS (SPSS for Windows, 1998), including reading data in from other programs, and use of syntax. Access to a personal computer with a large hard drive (13.1 gb), hi-capacity RAM (128 mb) and a 550 MHz microprocessor was a key factor enabling the researcher to work with the data in an efficient manner.

Statistical consultation was obtained during both the selection of the data set and throughout the process of working with the data. Other consultations were obtained as well, including meetings with researchers who had also done secondary analysis of large, existing data sets. Completion of the project took approximately one year, most of which was spent selecting, preparing and analyzing data.

Selecting a data set

After careful review of the conceptual basis for the study, the search for a suitable existing data set began. A list of ideal variables, based on the literature review, was compiled and used to guide the selection. The list can be found in Appendix A. The search was also guided by how recently the data were collected and the nature and size of the sample.

An on-line search was the primary mechanism by which data bases were explored. Government web sites (such as the CDC, NIA and NCHS sites), as well as the National Archive of Computerized Data on Aging and a local university site (with membership in the Interuniversity Consortium for Political and Social Research), were checked.

Evaluating a data set for possible use

After an extensive search, the Second Supplement on Aging, 1994, Version 2 (SOA II) (NCHS, 1998), was chosen because of relatively recent data collection and the close match between variables thought to be related to the concept of independence and variables available in the data set. The latter may be found in Appendix B. A CD-ROM containing the data and supporting documentation was ordered, on-line, for \$16.00.

Because this data set is in the public domain, no permission was needed for use. NCHS did request, however, that a disclaimer be included in any published material, noting that analyses, interpretations, or conclusions are those of the author (recipient of the data file) and not NCHS, which is only responsible for the initial data. A suggested citation was also included.

SOA II (NCHS, 1998) is a collaborative effort of the National Center for Health Statistics (NCHS) and the National Institute on Aging (NIA) for the purpose of providing data so that the health and functioning of older Americans may be analyzed. It is a follow up to the original Supplement on Aging, conducted approximately 10 years prior. The SOA II data file contains information from several sources: the 1994 National Health Interview Survey Core questionnaire (NHIS), the Access to Care Supplement, and the

National Health Interview Survey on Disability (NHIS-D), Phases 1 and 2.

Sampling followed a stratified, multistage, probability design that permitted continuous sampling of the target population. Interviews were conducted in selected households each week throughout the year, with samples being additive over the course of the year. Persons excluded from the Core interview were those in long-term care facilities, persons on active duty with the U.S. Armed Forces, and U.S. nationals living in foreign countries. The sample design allowed for collection of data in four major geographic regions of the country. Interviewers were permanent staff of the U.S. Bureau of the Census.

The sample included noninstitutionalized civilian U.S. residents age 70-and-over who completed the NHIS Core Interview. Sample size was 9,447 subjects, with females comprising 60.4%. The age range was 69 to 99 years, with a mean of 76.4 ± 5.8 years. Variables containing information about race, ethnicity, marital status, living arrangement and income were also available. Sample size was sufficient overall, as well as for subgroup analysis.

The overall response rate was 87.4%. Of this sample, 84.5% were self-respondents (78.3% entirely-self and 6.2% partially-self); 14.4% were proxy respondents; 1.1% were unknown because of a failure by the interviewer to indicate the type of respondent (NCHS, 1998).

The definitions of certain variables or phrases used at the time of data collection were checked by referring to documentation available on-line (Adams & Marano, 1995). No problems were noted in this area.

An identified limitation of the data set is the under representation of 70-year-olds in the sample. This was due to a delay in interviewing between Phase 1 and 2. This produced a second limitation, in that some follow up interviews were completed by proxy respondents (NHCS, 1998).

Exploration of the data set

Upon receipt of the CD-ROM, documentation files were printed for inclusion in a code book. Documents included background information, goals and objectives of the study, survey design, respondent type, response rate, as well as other information related to methods. Additional files included information on variance estimation and citations based on either the Longitudinal Study of Aging or the Supplement on Aging. At a later date, the code book, containing information on over 1300 variables, was printed.

Using the Statistical Export and Tabulation System interface provided on the CD-ROM, data in ASCII format were read into SPSS Version 9.0.0 (SPSS for Windows, 1998). Frequencies were run on variables selected randomly throughout the data set and checked against frequencies in the code book. Using syntax, each variable was named in accordance with the name provided in the code book. Notes were made during the process, identifying specific variables of interest, and noting potential issues.

Variables of interest were checked for suitability in meeting statistical assumptions necessary for factor analysis. Criteria included interval-level data or higher, a nonzero variance and normal (or near-normal) distribution. Dichotomous variables were allowable when absolutely necessary (Polit, 1996). Variables with too much missing data were excluded because of the potential loss of cases when missing data

were excluded listwise.

Of 51 initial variables of interest, 18 were lost to analysis because of failure to meet the above criteria. This left 33 indicator variables of interest for the final analysis. The loss of these variables, while not ideal, did not preclude the use of the data set in final analysis.

Preparation of data for analysis

Proceeding with plans to use the data set, variables were recoded as necessary. Reverse coding was done as necessary to assign the highest score to the answer reflecting the highest level of independence. For example, because an answer of zero ('no deficits') on functional activity reflected the highest level of function and seven (deficient in all areas) represented the lowest level of function, the investigator recoded answers so that 'no deficits' got the highest score and seven deficits received a score of zero.

Age was recoded into smaller groups than originally provided. Similarly, the original variable on main racial background was recoded so that analysis of more subgroups could be conducted.

When possible, scores were computed from a series of yes/no questions. For example, a series of dichotomous answers about health care access issues did not meet the statistical assumptions for interval-level or higher data. By computing a score based on yes/no answers to the series of questions, a variable was created that acted more like discrete interval data. The computation of these scores was noted in an appendix.

User-defined missing values were substituted for answers such as 'not applicable,' 'refused,' and 'don't know.' When variables were in suitable form for the

final analysis, syntax was used to write demographic, methods and independent variables into a new, smaller file.

The analysis phase

At the beginning of this phase, a filter variable was created to randomly set aside 2/3 of the sample for development of a model of independence, with the remaining 1/3 reserved to cross-check the model. Tests of difference revealed no statistically significant differences between the two groups on age, sex, main racial background (when recode # 2 was used), or economic status. There were statistically significant differences based on marital status and living arrangement. This information was useful in explaining possible differences between models developed on both samples.

The remaining 33 variables of interest were entered into factor analysis. An additional 12 variables were lost at this point because of high inter-item correlation, low overall correlation, or low measures of sampling adequacy, leaving only 21 variables in the final model.

A lengthy and complex analysis ensued, resulting in development of a three-factor model for independence. The three factors, accounting for 49% of the variance in the model, were physical function, social ability and physical health. Factor scores were produced through multiple regression and saved as variables. Multiple linear regression was used to assess the effects of sex, age, race, ethnicity, marital status, living arrangement and income to predict physical function, social ability and physical health (Baker, 2000).

A major strength of this study was the size of the sample. It was also an

inexpensive, efficient way to develop an initial understanding of the concept of independence among older, community-dwelling U.S. residents.

There were several limitations. The representativeness of the sample is debatable, realizing methodological considerations in the study of older persons. Several sources of bias may be present, such as recall, age and cohort effects, and social desirability.

The relative wellness of this civilian population resulted in the loss of important variables, such as use of professional services in the last 12 months, because of nonnormal distribution. It also contributed to a lack of variance on other variables, such as problems being home alone. Skip patterns, lack of response, or coding of nonresponses contributed to many variables being lost because of too much missing data.

Another drawback from use of the dataset is that the resulting model of independence is limited by the variables that made it to the final analysis. The model cannot, of course, reflect what is not there. Also, some variables may not have loaded substantially on a factor because available variables were not robust measures of the underlying construct. Had different indicators been provided, the factors may have reflected a different mix of variables. Because of these issues, interpretation of the results and use of the preliminary model of independence is limited.

Summary

Analysis of existing data sets is a research method that is becoming increasingly accessible through advances in computer and Internet technology. While significant limitations exist to the use of these data, careful evaluation and exploration of the data can alert the researcher to these issues and guide decisions about questions that may or

may not be answerable given the nature of the data.

Chapter 4

An exploratory analysis of the concept of independence in older, community-dwelling adults in the United States.

Conceptual Basis

Over the next 50 years, there will be a marked increase in the population of older persons in the United States. Trends indicate explosive growth in the 85-and-over age group, as well as shifts in ethnic diversity (Administration on Aging, 1997; Day, 1996). Females will continue to make up the majority of the older population. When compared to older men, older women are at increased risk for chronic illness and disability, living alone and poverty (Administration on Aging, 1997; Chater, 1996; Dimond, Catanzaro, & Lorensen, 1997; LaCroix, Newton, Leveille, & Wallace, 1997; Moon & Mulvey, 1996; Smeeding, Estes & Glasse, 1999).

Many public and private programs have emerged in support of older persons in the U.S. The goal of many of these programs is to help older Americans maintain their independence. Assessments of independence are sometimes reduced to a single variable: ability to live alone (McGarry & Schoeni, 1998; Schank & Lough, 1989; Smits & Kee, 1992; Taira, 1988). There is, however, no consensus in the literature as to the meaning of independence, thus making it difficult to accurately assess or measure the outcome of such programs.

What is independence?

Independence is a value and an attribute that is deeply ingrained in American history. It is a belief system that rewards people for being proud and self-reliant (Butler,

1975). Independence is reflective of characteristics of the early immigrants: the Protestant work ethic, the frontier mentality and extensive social and geographic mobility (Rubinstein, Nagy, & Kilbride, 1992; Triandis, 1995).

It also reflects values held in an industrial society, where attaining or maintaining independence is closely tied to productivity and paid work. Strong financial standing in old age is seen as a reward for cultivating good qualities in younger years, such as hard work, moderation and foresight. Those who fail to arrive at old age with the necessary resources are often thought of as failures, despite the fact that for many, poverty (or near-poverty) in old age is the result of social, political and economic forces beyond their control.

Notions of independence are also shaped by cultural influences. Individualism and collectivism are continuum-based cultural constructs that describe the relationship of an individual to the collective. Individualism and collectivism are respectively correlated to independent and interdependent views of self, with varying degrees of each found within cultures and within individuals. The 'majority' culture of the United States is thought to be the most individualistic culture in the world (Matsumoto, 1996; Murphy, 1998; Singelis, 1994; Thompson, 1997; Triandis, 1995).

Physical and cognitive function are often seen as key factors in the level of independence experienced by older persons (Rowe and Kahn, 1998). Those with fluctuating or declining physical and cognitive function often employ compensatory strategies to maintain their independence. For many, it requires either adaptation *to* the environment or adaptation *of* the environment. When these adaptations fall short,

individuals may cope with declining ability by redefining or readjusting their perception of independence and their perception of self (Ball & Whittington, 1995). Thus, independence may be sustained or enhanced by ability or adaptability.

Social and financial resources may play an important role in supporting an individual's desired level of independence. Social support is an important component of well-being, and a resource for independence (Arling & McAuley, 1984; Mancini, 1984; Wan, Odell & Lewis, 1982). For those who live alone, remaining independent depends on the strength of an informal support network and a willingness to accept help. The ability to reciprocate eases negative emotions associated with accepting help. When money is in short supply, nonmonetary resources, such as interpersonal skills, time or life experience (such as a veteran or surviving the Depression) may be helpful in maintaining a sense of power and control (Atchley, 1980; White & Groves, 1997).

Certain assumptions about independence and older persons may not be justified. Those who live alone are not necessarily 'independent', just as those who live with others are not necessarily 'dependent'. Also, it cannot be assumed that independence is a desired or appropriate goal for all older persons. Individuals interpret independence within a personal and societal context. Some cultural practices may call for high levels of *interdependence* while others respond to expectations on either end of the continuum. Those who meet societal expectations for being independent (living alone) may suffer from loneliness, isolation and depression. They may also avoid or refuse much needed help.

Review of the literature suggests that independence is not a static, dichotomous

state, but rather one that exists on a dynamic continuum with interdependence and dependence. Perceptions or degrees of independence are fluid, varying *between* or *within* individuals over time. Actual or perceived independence may be influenced by historical, cultural, economic, and social factors, as well as physical and cognitive ability or adaptability. Variation in or among these factors may predispose individuals to greater or lesser level of independence. Access to certain resources may also play a role in maximizing independence.

Given the lifelong disadvantages experienced by cohorts of women who are currently aged 65-and-over in the U.S., and the increased risk of chronic illness, disability, and poverty faced by older women in this country, it is hypothesized that older, community-dwelling women are more at risk for loss of (or lessened) independence than their male counterparts. In addition, it is hypothesized that certain subgroups of older women are more at risk for loss of (or lessened) independence, based on marital status, race, ethnicity, living arrangement or economic status. The first step in testing these hypotheses is exploration of factors underlying the concept of independence.

Purpose of the study

The purposes of the study are to a) describe and analyze the concept of independence within the context of older, community-dwelling U.S. residents, using the Second Supplement on Aging (NCHS, 1998) and b) compare independence factors between men and women, and among subgroups. Specific aims include:

1. Identify major components of the concept of independence, using exploratory factor

analytic techniques on the Second Supplement on Aging (NCHS, 1998).

2. Propose a model of independence based on factor analysis and literature review.
3. Compare factor scores among subgroups based on sex, age, race, ethnicity, marital status, living arrangement and economic status.
4. Determine the extent to which living arrangement is an appropriate proxy for independence.
5. Suggest a working definition of independence based on these preliminary results.

This study is an initial step toward challenging assumptions about independence, and developing a model of independence in the context of older, community-dwelling Americans. It may also serve as a conceptual base when independence is used as a goal or expected outcome in policies and programs.

After presentation of the methods, the results section is divided into two parts: 1) results of exploratory factor analysis identifying the major components of independence based on data from the Second Supplement on Aging (NCHS, 1998) and 2) comparison of predictors of independence among subgroups.

Methods

Second Supplement on Aging

Description. The data set chosen for this analysis was the Second Supplement on Aging, 1994, Version 2 (SOA II). SOA II is a followup to the Longitudinal Studies of Aging (LSOA), conducted approximately ten years prior. It is a collaborative effort of the National Center for Health Statistics (NCHS) and the National Institute on Aging, with the purpose of providing data with which to analyze the health and functioning of older

Americans. The data set is in the public domain and available on CD-ROM through the Data Dissemination Branch of NCHS. Any analyses, interpretations, or conclusions reached in this paper are those of the author, not NCHS. NCHS is only responsible for the initial data. SOA II was chosen because of the close match between variables thought to be related to the concept of independence and variables available in the data set. The large sample size enables analysis based on various demographic and socioeconomic characteristics.

Specific aims. The specific aims of SOA II are to provide replication of the LSOA to determine changes in disability among older persons over the past decade and to provide a base for the LSOA II. In addition, SOA II provides information on the causes and correlates of changes in health and functioning in older Americans, including background demographic characteristics, health behaviors and attitudes, preexisting illness, and social and environmental support; the sequence and consequences of health events, including utilization of health care and services for assisted community living; the physiological consequences of disability such as pain and fatigue; social consequences such as changes in social activities, living arrangements, social support, and use of community services; and on the deployment of assisted living strategies and accessibility of technological and environmental adaptations.

Survey design. The SOA II data file contains information from several sources: the 1994 National Health Interview Survey (NHIS) Core questionnaire, the Access to Care Supplement, and the National Health Interview Survey on Disability (NHIS-D), Phases 1 and 2. NHIS data included in the SOA II file are from initial interviews that

were conducted between January and December of 1994. These interviews included questionnaires for Phase 1 of the 1994-1995 NHIS-D. Thus, data for the 1994 NHIS Core Interview and Phase 1 of the 1994-1995 NHIS-D were collected at the same time. Surveys were conducted by trained interviewers from the U.S. Bureau of the Census (National Center for Health Statistics, 1998).

National Health Interview Survey. The NHIS is an annual, in-person interview survey of noninstitutionalized civilian residents of the United States. The survey includes questions about demographics, basic health items and selected current health topics. For 1994, the Access to Care Supplement was included as one of the current health topics. In the 1994 survey, oversampling was done in the Black population. An attempt was made to oversample Hispanics, but a significant cost increase could not be justified for the projected small improvement in precision.

National Health Interview Survey on Disability. The NHIS-D was designed to develop a better understanding of disability, provide baseline descriptive statistics on the effects of disabling conditions, produce simple prevalence estimates of various health conditions, and to guide public health policy development. NHIS-D included questions about pathology and/or impairment, functional limitations and disability. The intended respondent for Phase 1 NHIS-D was the same person who was interviewed for the Core survey. Answers to these questions determined eligibility for Phase 2, known as the Disability Followback Survey (DFS).

Once eligible, individuals were screened into Phase 2 based on data from the Phase 1 interview, the NHIS Core interview, and the Family Resources Supplement.

Inclusion criteria for NHIS-D Phase 2 were individuals who were receiving disability benefits, had specific impairments or were limited in their usual activities, or who had made adaptations due to presence of a health condition. Because the screening criteria were broad, over 50% of persons age 70-and-over were screened into the Phase 2 interview.

Two separate instruments were used to collect data for Phase 2: the DFS-2 and the DFS-3. The DFS-2 contained all the same questions as DFS-3, plus additional questions about disability status and issues relevant to the population of people with disabilities. The DFS-2 was administered to all adults (age 18-and-over) who were screened into Phase 2 based on the presence of a disabling condition. A little over half of the total 70-and-over sample (n=4,928) were interviewed. The DFS-3 was specifically designed for SOA II and was administered to the remaining 4,519 persons who were 70 years of age and over, but did not meet NHIS-D screening criteria for disability.

The overall response rate for SOA II was 87.4%. This was calculated by multiplying the overall household response rate from the NHIS Core interview (94.1%) by the age-eligible persons who responded to SOA II (92.9%). Of this sample, 84.5% were self-respondents (78.3% entirely-self, 6.2% partially-self); 14.4% were proxy respondents; 1.1% were unknown because of a failure by the interviewer to indicate the type of respondent. Phase 2 answers by proxy were necessary in cases where the sample person (identified in Phase 1) was hospitalized; institutionalized; had hearing, language or speech problems; poor memory, senility or confusion; Alzheimer's or other mental condition; physical illness or disability or 'other' nonhealth reason.

Initially, the lag time between Phase 1 and Phase 2 was planned to be 6 months. However, delays resulted in interviews occurring between 7 and 17 months after the initial interview. This resulted in two limitations to the study. First, because of the delay between the first and second interviews, some 68 year olds had turned 70 by the time of the second interview. Because only those who were 69-and-over at Phase 1 were screened for the SOA II interview, these 68 year olds were missed. Thus, 70 year olds in the sample are slightly underrepresented. Second, the delay resulted in some followup interviews being completed by proxy respondents (NCHS, 1998).

Sampling. Sampling followed a stratified, multistage, probability design that permitted a continuous sampling of the target population. Interviews were conducted in selected households each week throughout the year, with samples being additive over the course of the year. The design allowed for collection of data in four major geographic regions of the U.S. (Northeast, Midwest, South and West) and selected places of residence within the United States. Interviewers were permanent staff employed by the U.S. Bureau of the Census. The annual response rate is over 95%, with nonresponders divided equally between those who refuse to participate and those who cannot be found at home despite repeated calls (Massey, 1989).

The sample for this survey included all persons age 70-and-over who completed the NHIS Core Interview. SOA II has a sample size of 9,447 subjects. The percentage of females is 60.4%. Respondents range in age from 69 to 99 years, with a mean of 76.4 ± 5.8 years. The racial background of the respondents is 87.2% White (n=8,235), 10.7% Black (n=1,009), and 2.1% Other (n=203). Blacks were oversampled for this survey.

Hispanics represent approximately 4.8% of the sample. Fifty-three percent of the respondents are married; 46.5% unmarried (widowed, divorced, separated or never married); less than 1% unknown. Those who live alone represent approximately 35% of the sample; those living with a spouse, other relative or nonrelative comprise the other 65%. Those living below the federal poverty threshold accounted for 10.8% of the sample, with the remaining 89.2% at or above the limit.

Human Subjects Protection Issues

Based on both legal and moral obligation, NCHS guarantees protection of all personal information given by respondents. Participation is strictly voluntary, based in part on whether potential respondents agree with how NCHS will use their information and with whom it would be shared. NCHS is prohibited from using personal information for any purpose other than what was described to survey participants and from sharing that information with anyone not clearly mentioned to them. Names, addresses or direct identifiers are removed from internal files unless absolutely needed. In addition, information included on electronic files is removed if it may lead to identification of a subject when certain data are linked.

NCHS is subject to federal regulations concerning the protection of human research subjects, provisions of the Privacy Act, and the Statistical Confidentiality Executive Order (National Center for Health Statistics, 1999). Because of protections ensured by federal regulations, secondary analysis of these data for the current study qualified for exemption from human subjects review through the University of Washington Human Subjects Division.

Results: Development of the model through factor analysis

Factor analysis

Factor analysis refers to a variety of approaches to determining the structure of relationships among observed variables. Factor analysis is based on the assumption that a relatively small number of underlying common factors are responsible for the covariation among a much larger group of observed variables. Exploratory factor analysis (EFA) is a data reduction technique by which underlying dimensions of a concept, such as independence, may be identified from a much larger set of observed variables. EFA is often used early in a research program as a heuristic device. Confirmatory factor analysis is used to test hypotheses about the structure of variables, either clusters of variables that have been identified through EFA or selected through a theory-building process (Kim & Mueller, 1978a; Dixon, 1997; Nunnally, 1994; Polit, 1996). Because this study is an initial step toward understanding the concept of independence, exploratory factor analysis was chosen for its heuristic value.

Generation of random subsamples. Sample size requirements in EFA are usually assessed in terms of the number of variables being considered. In general, the number of cases must exceed the number of variables (Nunnally, 1994). According to Polit (1996), a 10:1 ratio of subjects to variables is necessary in order to make the results generalizable.

Soon after the data set was received, a variable was created that randomly selected 2/3 of the sample (Sample A) upon which the model for independence could be developed. The remaining 1/3 (Sample B) was set aside for the purpose of cross-

Table 1. Characteristics of sampled persons in Second Supplement on Aging (NCHS, 1998) for Model A (2/3 of sample, n=6,325), Model B (1/3 of sample, n=3,122) and Model C (total sample, n=9,447).

Characteristic	Model A (n/%)	Model B (n/%)	Model C (n/%)
Sex			
Male	2507 (39.6)	1237 (39.6)	3744 (39.6)
Female	6325 (60.4)	1885 (60.4)	5703 (60.4)
Age group			
70-74	2429 (38.4)	1235 (39.6)	3664 (38.8)
75-79	1853 (29.3)	901 (28.9)	2754 (29.2)
80-84	1230 (19.4)	582 (18.6)	1812 (19.2)
85-89	538 (8.5)	295 (9.4)	833 (8.8)
90-94	231 (3.7)	94 (3.0)	325 (3.4)
95-99	44 (0.7)	15 (0.5)	59 (0.6)
Race			
White	5443 (86.1)	2634 (84.4)	8077 (85.5)
Black	627 (9.9)	373 (11.9)	1000 (10.6)
Native American	35 (0.6)	16 (0.5)	51 (0.5)
Asian/Pacific Is.	111 (1.8)	30 (1.0)	141 (1.5)
Other	31 (0.5)	28 (0.9)	59 (0.6)
Multiple	7 (0.1)	3 (0.1)	10 (0.1)
Unknown	71 (1.1)	38 (1.2)	109 (1.2)
Spanish origin			
Non-Hispanic	6038 (95.5)	2957 (94.7)	8995 (95.2)
Hispanic	231 (3.5)	123 (4.0)	354 (3.7)
Unknown if Hispanic	56 (0.9)	42 (1.3)	98 (1.0)
Marital status			
Married	3281 (51.9)	1717 (53.7)	4998 (52.9)
Widowed	2407 (38.1)	1108 (35.5)	3515 (37.2)
Divorced	301 (4.8)	137 (4.4)	438 (4.6)
Separated	52 (0.8)	22 (0.7)	74 (0.8)
Never married	250 (4.0)	120 (3.8)	370 (3.9)
Unknown	34 (0.5)	18 (0.6)	52 (0.6)
Living arrangement			
With spouse	3206 (50.7)	1676 (53.7)	4882 (51.7)
With relative-other	832 (13.2)	397 (12.7)	1229 (13.0)
With nonrelative	45 (0.7)	18 (0.6)	63 (0.7)
Alone	2242 (35.4)	1031 (33.0)	3273 (34.6)
Income			
Under \$5,000	145 (2.3)	69 (2.2)	214 (2.3)
\$5,000-\$6,999	292 (4.6)	147 (4.7)	439 (4.6)
7,000-9,999	523 (8.3)	257 (10.8)	780 (8.3)
10,000-14,999	863 (13.6)	458 (14.7)	1321 (14.0)
15,000-19,999	721 (11.4)	354 (11.3)	1075 (11.4)
20,000-24,999	614 (9.7)	293 (9.4)	907 (9.6)
25,000-34,999	684 (10.8)	356 (11.4)	1040 (11.0)
35,000-49,999	448 (7.1)	223 (7.1)	671 (7.1)
50,000 and over	490 (7.7)	213 (6.8)	703 (7.4)
Unknown	1545 (24.4)	752 (24.1)	2297 (24.3)

validating the model. The random split produced sample sizes of 6,325 and 3,122 in Samples A and B respectively, yielding more than sufficient sample sizes. Testing of the final model (Model C) will make use of the entire sample. Characteristics of subjects in Samples A, B and C are listed in Table 1.

Comparison of Samples A and B. Tests of difference were run on key variables related to the specific aims of the study to ascertain whether random subsamples A and B were sufficiently similar by which to compare the resulting models. Significant differences on key variables may assist in the interpretation of conflicting results. Alpha was set at .05 for these tests of difference.

Age. Two age variables were available for use in the data set. Information on age was collected during Phase 1. Mean age at Phase 1 was 76.4 ± 5.8 years (range 69-99). Because Phase 2 surveys were conducted between 7 and 17 months after Phase 1 data were collected, a second age variable entitled *recalculated SOA II age*, which reflected the sample person's age at the time of the Phase 2 survey, was provided. Since 18 of 21 variables entered into analysis were collected during Phase 2, a decision was made to use the recalculated age variable. (The three remaining variables collected during Phase 1 were *number of MD visits last year*, *bed days last year*, and *education*, the last of which is not likely affected by the time lag). Mean recalculated SOA II age was 77.4 ± 5.8 years (range 70-99).

Comparison of recalculated age by independent samples t-test showed no statistically significant difference between Samples A and B ($t = -1.537$, $df = 9,445$, $p = .124$). When the recalculated age variable was recoded into age groups (70-74, 75-79,

Variable	Categories	X ²	df	Sig. (2-tailed)
Race recode #1	White/Black/Other	12.168	2	.002
Race recode #2	White/Non-White	2.996	1	.083
Race recode #3	Black/Non-Black	8.246	1	.004

80-84, 85-89, 90-94 and 95-99 years), chi-square tests revealed no significant difference between the samples ($X^2_{(5)}=7.718$, $p=.172$).

Sex. Chi-square testing showed no statistically significant difference between the number of males and females in each sample ($X^2_{(1)}=.000$, $p=.989$).

Race. The original variable for *main racial background* included answers by respondents in 14 distinct categories, plus answers for 'other A/PI' (n=3), 'other race' (n=59), 'multiple race' (n=10) and 'unknown' (n=109). Because some categories were too small to be analyzed separately and may have produced unreliable estimates, three recoded race variables were included in the data set, as shown in Table 2. For these recodes, respondents who answered 'other' or 'unknown' were classified in the resulting recodes by using the racial background observed by the interviewer.

All three recoded race variables were tested for differences between samples. As seen in Table 2, there were statistically significant differences in actual versus expected counts in two of three variables. A possible explanation is the over sampling of Blacks for the 1994 survey (Massey, 1989). 'Race recode #2' will be used when comparing Models A and B.

However, in the final analysis, race categories as shown in Table 1 will be used to highlight disparities by group.

Marital status. Data on marital status were collected at both Phase 1 and Phase 2.

Frequencies for both variables are shown in Table 3. The difference between first and

Table 3. Comparison of counts by marital status variables in Phases 1 and 2.

Marital status	Phase 1 (n)	Phase 2 (n)	Δ (n)
Married, spouse in household	4888	4637	-251
Married, spouse not in household	110	122	+12
Widowed	3515	3671	+156
Divorced	438	430	-8
Separated	74	76	+2
Never married	370	376	+6
Unknown	52	114	+62
Don't know/refused	-	21	+21
Total	9447	9447	

second phase answers are noted in the last column. Variability in answers over time may be explained by actual changes in status, social desirability, proxy responses, or bias introduced by a different interviewer.

Again, because most of the variables used in the final model were from Phase 2, marital status at Phase 2 was chosen for the analysis.

Chi-square testing by marital status in Samples A and B yielded $X^2_{(5)}=9.766$, $p=.082$. While these differences were not statistically significant at $\alpha = .05$, it should be noted that in Sample A, there are higher than expected numbers of widowed, divorced, separated and never married. Conversely, there are higher than expected counts in Sample B of those in either married categories.

Variable	Categories	X ²	df	Sig (2-tailed)
Family income (annual)	27 categories (\$5,000 increments up to \$50,000 and over)	21.258	26	.729
Family income (annual)	Less than \$20,000/\$20,000 or more	.539	1	.463
NHIS Poverty Index	Below poverty threshold/ At or above poverty threshold	.297	1	.586

When marital status was recoded into two categories (married/unmarried), there was a statistically significant difference between Samples A and B ($X^2_{(1)}=7.585$, $p=.006$) For this reason, a dichotomous variable for marital status will not be used to compare Models A and B.

Living arrangement. Assessment of living arrangement shows a statistically significant difference ($X^2_{(3)}=8.051$, $p=.045$) between Samples A and B. In Sample A, there were lower than expected counts for those 'living with spouse' and higher than expected counts in categories 'living alone,' 'living only with nonrelative,' and 'living with relative - other.' The converse was true for Sample B. These discrepancies may be explained by differences in marital status between samples, noted earlier. Although marital status differences by sample did not reach statistical significance, there were lower than expected numbers of married respondents in Sample A. This most likely explains the lower than expected counts in 'living with spouse' (Sample A) in the living arrangement variable. When recoded into a dichotomous answer (lives alone/lives with others), there is still a statistically significant difference between Samples A and B

$(X^2_{(1)}=5.565, p=.018)$.

Economic status. Three variables were available by which to assess the respondent's economic status. Regardless of the indicator selected, there were no statistically significant differences between Samples A and B (Table 4).

Data preparation. Most variables required some treatment prior to use. A description of variables included the final analysis is found in Appendix C. Variable answers were recoded from low to high as needed to reflect low to high levels of independence, respectively. Sums were computed as needed to create scores from multiple dichotomous variables that assessed related items.

Treatment of outliers was necessary at times to correct skewness and improve the meaningfulness of the findings. For example, respondent answers regarding the number of sons and daughters (including step and adopted) ranged from 0-60 and 0-41 respectively, although most answers were in the very low range. These answers were recoded into categories of '0', '1', '2', '3', and '4 or more' sons or daughters.

User-defined missing values were assigned to answers such as 'don't know,' 'refused,' and 'not applicable.' Cases with missing values were excluded listwise. Because this resulted in a progressive loss of subjects, variables were entered into the analysis by least number of missing in order to minimize loss of cases.

Variable selection. Because factor analysis is based on the correlation matrix, statistical assumptions and requirements are the same as those for correlational analysis. Random and independent sampling from the target population is assumed. Suitable variables are interval level or higher, normally distributed and have nonzero variance.

The use of dichotomous variables is tolerable if the purpose of the analysis is to identify general clustering of data. (Their use should be limited because of attenuation effects on correlations.) Lastly, the correlation matrix must be factorable (acceptable number of correlations $>.30$) with no missing data in the matrix (Dixon, 1997; Kim & Mueller, 1978a; Kim & Mueller, 1978b; Nunnally, 1994; Polit, 1996).

Item	Missing	Var.	Dist.
Number of years since last retirement	x		
Number of helpers listed	x		
How long married to current spouse	x		
How long widowed/divorced/separated	x		
Response time of children	x		
Response time of family	x		
Contact with children (score)	x		
Contact with family (score)	x		
Has telephone		x	
Number of acute incidence conditions		x	
Ever resident/patient in nursing home		x	
Ever worked		x	
Problems being home alone		x	
Number of 2-week doctor visits			x
Years lived in state of present residence			x
Years in the United States			x
Access to care issues (score)			x
Professional services used last 12 mos (score)			x

Based on the literature review, 51 variables were selected for possible submission to factor analysis. Variables not satisfying statistical assumptions and requirements (n=18) were excluded from further consideration, (see Table 5) which left 33 potential variables for analysis.

Factor Analysis

There are a variety of factor analytic techniques available to the researcher. Principal components analysis (PCA) is a technique that assumes that all measurement error is random and all variables contribute to the solution. The correlation matrix is characterized by unities in the diagonal. Each extracted component maximizes the variance explainable from the correlation matrix. The goal, assuming that factors are linear combinations of the observed variables, is to find a principal component that explains as much variability as possible. Additional uncorrelated components are sought to explain as much of the remaining variability as possible.

Based on the correlation matrix, both an unrotated and a rotated factor matrix are produced. Unrotated factor matrices are usually difficult to interpret. Rotation of the matrix results in a mathematically equivalent solution where factors have high loadings on some variables and low loadings on others. By assessing this pattern, the researcher can more easily decide which variables reflect the essence of the factor. Varimax is an orthogonal rotation method that maximizes the variance among uncorrelated factors. These techniques (PCA with a Varimax rotation) were chosen for the analysis based on ease of interpretation and, because of their widespread use, ability to compare results across studies (Dixon, 1997; Fisher & Van Belle, 1993; Kim & Mueller, 1978a; Kim &

Mueller, 1978b; Nunnally, 1994; Polit, 1996).

Initial Item Reduction. Using SPSS version 9.0.0 (SPSS for Windows, 1998) and Sample A, the remaining 33 variables were entered into factor analysis, using PCA and a Varimax rotation. The resulting model had a Kaiser-Meyer-Olkin (KMO) Measure of

Table 6. Variables excluded from final analysis because of high inter-item correlation, extremely low correlation (one-sided $p > .05$) or KMO $< .60$.

Item	High inter-item correlation	Low correlation	Low KMO
Number of persons in household	x		
Number of generations in household	x		
Length of time at residence		x	
Insurance coverage (score)		x	
Number of living children		x	
Number of living sisters		x	
Veteran experience (years)			x
Family income			x
Size of family			x
Hospital days last year			x
How often sad/depressed last year			x
Number of implants (score)			x

Sampling Adequacy (MSA) of .867. Bartlett's Test of Sphericity, which tests the null hypothesis that the correlation matrix is an identity matrix, was rejected ($X^2_{(465)} = 28,536.32$, $p < .0001$) (Norusis, M.J., 1985; Polit, 1996). Nine components were extracted, with the first three accounting for 33% of the total variance.

In an effort to simultaneously create a maximized and parsimonious model, the

Table 7. Correlation matrix for Model A. Correlations > .30 in bold.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1. MD visit	1.00																					
2. Rec'd help	.196	1.00																				
3. Func. Act.	.275	.597	1.00																			
4. Home diff.	.154	.405	.559	1.00																		
5. Drive freq.	.106	.436	.393	.297	1.00																	
6. IADL	.224	.682	.642	.504	.436	1.00																
7. Social	.058	.262	.303	.234	.343	.299	1.00															
8. DME	.252	.388	.495	.371	.225	.417	.189	1.00														
9. Fallen	.101	.194	.249	.203	.122	.224	.089	.219	1.00													
10. Sensory	.156	.192	.240	.136	.137	.149	.043	.227	.152	1.00												
11. # cond rep	.342	.310	.440	.237	.141	.300	.098	.394	.171	.266	1.00											
12. Bed days	.385	.209	.287	.207	.140	.239	.118	.254	.078	.101	.244	1.00										
13. Self-rep hlth	.268	.359	.480	.303	.274	.367	.270	.293	.130	.145	.379	.212	1.00									
14. ADL	.213	.562	.736	.607	.367	.677	.306	.509	.249	.163	.327	.248	.397	1.00								
15. Act levl	.095	.245	.303	.206	.145	.251	.172	.191	.139	.140	.191	.067	.298	.259	1.00							
16. # Rx	.410	.282	.373	.226	.167	.293	.078	.345	.105	.198	.531	.239	.345	.292	.160	1.00						
17. Exercise	.033	.160	.212	.116	.149	.166	.196	.087	.033	.048	.086	.028	.189	.169	.177	.069	1.00					
18. Days out	.107	.386	.426	.344	.536	.406	.453	.261	.129	.127	.164	.142	.305	.408	.202	.171	.191	1.00				
19. Educ	.040	.148	.195	.127	.309	.158	.286	.077	.035	.003	.054	.093	.217	.143	.083	.048	.162	.247	1.00			
20. Ment/emot	.159	.214	.238	.166	.185	.256	.163	.126	.135	.092	.125	.144	.185	.212	.111	.135	.073	.151	.102	1.00		
21. Resid imp	.088	.235	.323	.400	.168	.293	.137	.220	.140	.092	.132	.118	.184	.349	.104	.127	.080	.182	.129	.111	1.00	

correlation and anti-image matrices were examined. Two variables were removed due to high (>.80) inter-item correlation. Four variables were eliminated because of extremely low correlation (one-sided p-value >.05) with other variables. Lastly, six variables were excluded because their individual KMOs were less than .60 (see Table 6). Of the 21 remaining variables, 18 were interval level or higher. Three dichotomous variables (*received help with ADLs or IADLs; fallen in the past year; regular exercise routine*) were retained because of their substantive contribution to the model.

Model A. Using Sample A, the remaining 21 variables were entered into analysis as before. The resulting correlation matrix is shown in Table 7. Sample size was 4,927, KMO was .912 and the results of Bartlett's Test of Sphericity were $X^2_{(210)} = 31,796.89$, $p < .0001$. Individual MSAs ranged from .842 to .953. Four components were extracted and accounted for 49.2% of the variance in the model (see Table 8). Since this analysis was done on Sample A, this model is referred to as Model A.

Component	Initial Eigenvalues		
	Total	% Variance	Cumulative %
1	6.170	29.362	29.362
2	1.795	8.549	37.931
3	1.282	6.102	44.034
4	1.095	5.214	49.247

Components were evaluated in order to decide how many factors to retain in the model. The scree test, a plot of the Eigenvalues, was

(for Table 7) evaluated by placing a ruler along the bottom points and noting points which appeared above the line. Three points were noted to be above the scree. Consistent with this, components 1, 2 and 3 all had Eigenvalues >1.25 and taken together,

accounted for 44% of the variance in the model. (In some cases, investigators retain components that individually explain more than 5% of the variance, although that criterion was not used in this study.)

Based on the scree plot, Eigenvalues >1.25 , and the conceptual basis for the model, a decision was made to retain three factors. Factor loadings for Model A are shown in Table 9, along with their commonalities (h^2) or shared variance. Within these three factors, high variable loadings ($>.40$) were considered to have significant contribution to the underlying meaning of the factor. Variables with loadings $>.70$ were labeled as marker variables, as they are most likely only highly correlated with that factor, and provide clues as to its primary nature (Polit, 1996). Those that loaded high on two or more factors were noted, but not considered to be pure enough to belong to any one factor. When variables shared a significant loading ($\leq.20$ difference) on one or more factors, they were judged to be nonspecific to any one factor.

Identification of factors in Model A. In Model A, Factor 1 contains variables related to a person's ability to function in their everyday life, including how well they function in their homes (with or without assistance from others or from Durable Medical Equipment). It accounts for 29.4% of the variance in Model A. Three marker variables highlight the ability of the person to complete Activities of Daily Living and Instrumental Activities of Daily Living in their home environment without difficulty. Consistent with this, the next highest loading is on Functional Activity. The DME score variable loads at .524, but shares a significant loading (.360) with Factor 3 and thus, is not specific to either factor. Based on these results, Factor 1 is labeled 'Physical Function.'

Table 9. Model A. Principal components analysis with Varimax rotation. Only loadings $\geq .10$ are shown. Direction of variable coding are in parentheses, indicating answer with highest score. Underlined factor loadings indicate nonshared, high ($\geq .40$) loading. Factor loadings in **bold** indicate marker variables. *Italics* indicate high loadings that share significant loading(s) on another component ($\leq .20$ difference).

Variable	1	2	3	4	h^2
1. ADL ability (all)	.781	.239	.193	.166	.732
2. Home difficulty (none)	.740	.161	.102		.586
3. IADL ability (all)	.712	.314	.199	.136	.663
4. Functional activity (all)	.678	.286	.313	.288	.723
5. Receive help with ADL/IADL (no)	.615	.305	.194	.202	.550
6. Residential improvement needs (none)	.578				.344
7. DME score (none)	<i>.524</i>		<i>.360</i>	.233	.459
8. Fallen in the past year (no)	.397			.263	.237
9. Social activities last 2 weeks (7)	.161	.677			.492
10. Education (18 years or more)		.662			.446
11. Days left the house last 2 weeks (14)	.333	.642		.128	.542
12. Driving freq (every/almost everyday)	.325	.637			.519
13. Mental/emotional/psych problems (none)	.189	.245	.229		.148
14. MD visit score (none)			.769		.597
15. Number of Rx's supposed to take (none)	.146		.675	.302	.569
16. Bed days last year (none)	.166	.152	.647	-.228	.521
17. Number of conditions reported (none)	.203		<i>.611</i>	.427	.597
18. Activity level compared to one year ago (increased)	.155	.161		.648	.470
19. Sensory impairments (none)	.153		.208	.471	.298
20. Regular exercise routine (yes)		.392		<i>.465</i>	.377
21. Self-reported health score (excellent)	.210	.362	.382	.387	.470

Factor 2 reflects 'Social Ability' and accounts for 8.5% of the variance in the model.

Factor 3 includes four variables that most likely reflect 'Physical Health' and accounts for 6.1% of the variance in Model A. The marker variable is the *number of doctor visits* the person had in the past 12 months. While *number of conditions reported* loads at .611, it

shares a high loading with the fourth component. The fourth component also reflects aspects of physical health but has not met criteria to be considered for this model.

Of note is the fact that *self-reported health score* loads on all four extracted components, and three of these load above .300. This may be reflective of the overall importance of one's perception of health in overall functioning.

Component	Initial Eigenvalues		
	Total	% Variance	Cumulative %
1	6.28	29.9	29.9
2	1.815	8.643	38.550
3	1.279	6.091	44.641
4	1.080	5.145	49.786
5	1.007	4.796	54.582

Model B. Having developed a three-factor model on 2/3 of the sample, syntax was used to enter the remaining 1/3 of the sample (Sample B) into a

separate analysis. This new model, Model B, had a sample size of 2,434, KMO = .912, Bartlett's $X^2_{(210)} = 16,197.77$, $p < .0001$. Individual KMOs ranged from .813 to .953. Once again, using the scree test and a lower Eigenvalue threshold of 1.25, along with evaluation of the components, three factors were retained for Model B which accounted for 44.6% of the variance in Model B (see Table 10). Results for Model B are shown in Table 11. Variables loading on Factors 1 and 2 in Model B are consistent with variables loading on these two factors in Model A. Factor 1 retains *ADL ability* and *home difficulty* as marker variables, and accounts for 29.9% of the variance in Model B. Once again, *DME score* loads above .40, but shares high loading with another component. Factor 2 reflects social ability, with *driving frequency* being the marker variable in this model.

Table 11. Model B. Principal components analysis with Varimax rotation. Loadings $\geq .10$ are shown. Direction of variable coding are in parentheses, indicating answer with highest score. Underlined factor loadings indicate nonshared, high ($\geq .40$) loading. Factor loadings in **bold** indicate marker variables. *Italics* indicate high loadings that share significant loading(s) on another component ($\leq .20$ difference). For comparison, variables retain numbering from Model A.

Variable	1	2	3	4	5	h ²
1. ADL ability (all)	<u>.772</u>	.220	.181	.198	.157	.741
2. Home difficulty (none)	<u>.760</u>	.122			.113	.622
3. IADL ability (all)	<u>.678</u>	.342	.222	.164		.659
4. Functional activity (all)	<u>.654</u>	.269	.289	.302	.232	.728
6. Residential improvement needs (none)	<u>.619</u>			-.102	.111	.409
5. Receive help with ADL/IADL (no)	<u>.599</u>	.344	.210	.232		.575
7. DME score (none)	<i>.478</i>		.237	<i>.434</i>		.481
12. Driving freq (every/almost everyday)	.294	<u>.733</u>		.153		.660
11. Days left the house last 2 weeks (14)	.296	<u>.682</u>		.146	.114	.588
10. Education (18 years or more)		<u>.635</u>			.117	.427
9. Social activities last 2 weeks (7)	.121	<u>.634</u>			.262	.486
14. MD visit score (none)			<u>.718</u>	.201		.561
16. Bed days last year (none)	.150		<u>.713</u>			.542
15. No. of Rxs supposed to take (none)	.121		<i>.543</i>	<i>.481</i>	.209	.585
13. Mental/emotional/psych probs (none)	.292	.196	<i>.462</i>	-.242		.398
21. Self-reported health score	<i>.241</i>	<i>.241</i>	<i>.441</i>	.220	<i>.425</i>	.540
19. Sensory impairments (none)		.146		<u>.711</u>		.533
17. No. of conditions reported (none)	.150		<i>.494</i>	<i>.551</i>	.194	.609
8. Fallen in the past year (no)	.325			.388		.273
20. Regular exercise routine (yes)		.201			<u>.700</u>	.538
18. Activity level comp. to 1 year ago (increased)	.229			.122	<u>.658</u>	.506

This factor accounts for 8.6% of the variance. Factor 3, accounting for 6.1% of the variance in Model B, retains *MD visit score* as a marker variable, and adds *bed days last year* as a second marker variable. Four other variables load above .40 in Factor 3, but share loadings with other factors within .20. All four of these variables are related to

physical health. Once again, *self-reported health* loads on all extracted components. While Factor 3 in Model B is not as clearly indicated as in Model A, its inclusion is supported by the conceptual basis for the study.

Comparing Models A and B, the high loadings and tight clustering of the variable subject areas justify at least a two-factor model. While Factor 3 in Model A is not replicated in Model B, variable loadings for Factor 3 in both models consistently relate to physical health. Differences between components retained in Models A and B might be explained by differences between Samples A and B, noted earlier in this text. A three factor model is retained.

Model C. With the syntax that was used to create Models A and B, all subjects were entered into factor analysis so that the entire sample could be used for analysis of subgroups (Aim 3). Because cases were excluded for missing data listwise, the resulting sample size was 7,361 (78% of the original sample). Diagnostics for this model are

Component	Initial Eigenvalues		
	Total	% Variance	Cumulative %
1	6.205	29.548	29.548
2	1.800	8.569	38.117
3	1.279	6.092	44.209
4	1.083	5.157	49.366

consistent with Models A and B, with KMO = .914, individual KMOs ranging from .838 to .953, and Bartlett's $X^2_{(210)}$

=47,815.457, $p < .0001$. Extraction by PCA and a Varimax rotation yielded four components, three of which are retained for Model C. (see Tables 12 and 13). Factors 1

and 2 are consistent with Models A and B. Variable loadings in Factor 3 replicate those found in Model A. Model C will be used in the second part of the study to compare subgroups.

Table 13. Model C. Principal components analysis with Varimax rotation. Loadings $\geq .10$ are shown. Direction of variable coding in parentheses, indicating answer with highest score. Underlined factor loadings indicate nonshared, high ($\geq .40$) loading. Factor loadings in **bold** indicate marker variables. *Italics* indicate high loadings that share significant loading(s) on another component ($\leq .20$ difference). For comparison, variables retain numbering from Model A.

Variable	1	2	3	4	h^2
1. ADL ability (all)	<u>.780</u>	.233	.187	.190	.733
2. Home difficulty (none)	<u>.746</u>	.154			.594
3. IADL ability (all)	<u>.705</u>	.318	.209	.140	.660
4. Functional Activity (all)	<u>.675</u>	.279	.303	.314	.724
5. Receive help with ADL/IADL (no)	<u>.619</u>	.302	.208	.183	.550
6. Residential improvement needs (none)	<u>.582</u>				.345
7. DME score (none)	.523		.338	.262	.457
8. Fallen in the past year (no)	.389	-.111		.257	.230
9. Social activities last 2 weeks (7)	.147	<u>.675</u>		.111	.489
10. Education (18 years or more)		<u>.656</u>			.436
11. Days left the house last 2 weeks (14)	.328	<u>.645</u>		.138	.546
12. Driving freq (every/almost everyday)	.328	<u>.642</u>	.108		.533
14. MD visit score (none)			<u>.762</u>		.587
16. Bed days last year (none)	.153	.136	<u>.668</u>	-.177	.520
15. Number of Rx's supposed to take (none)	.148		<u>.638</u>	.379	.572
17. Number of conditions reported (none)	.199		<i>.581</i>	<i>.470</i>	.599
13. Mental/emotional/psych probs (none)	.216	.249	.295	-.103	.207
18. Activity level compared to 1 year ago (increased)	.168	.172		<u>.622</u>	.446
20. Regular exercise routine (yes)		<i>.384</i>	-.114	<i>.468</i>	.380
19. Sensory impairments (none)	.152		.191	<u>.462</u>	.279
21. Self-reported health score	.219	<i>.342</i>	<i>.384</i>	<i>.409</i>	.479

Discussion

In this exploratory study, three factors were identified as major components of the concept independence: physical function, social ability and physical health. These factors are supported by the conceptual basis for the study. Thus, Aims 1 and 2 of this study are met. An advantage of this study is the large sample size. It provides a high subject-to-variable ratio and increases the generalizability of the findings.

These preliminary findings should, however, be viewed with caution. A primary limitation of this study is the absence or loss of variables that could provide information about potential components of independence suggested by the literature review. Reliable measures of social support, role function, cultural influences, spiritual resources, coping skills, well-being, and quality of life are not available. In addition, robust measures of mental health and cognitive function are needed, as well as life experience.

Loss of some variables due to zero variance or nonnormal distribution is unfortunate but reflects the wellness of this civilian, noninstitutionalized sample. Skip patterns, as well as clumping of answers such as 'don't know', 'refused' or 'not applicable', also contributed to the loss of important information.

The nature of some variables made the analysis less robust. Many data points would have been usable had they been interval level or higher. For example, a variable (or set of variables) measuring *risk* for falls would have been more useful than a yes/no question asking if the sample person had fallen in the past year. In addition, responses about self-reported health were not verified by a health professional, and certain conditions may have been under- or overreported based on stigma associated with certain

conditions, interviewer style, or the presence of others during the interview.

Other limitations include inconsistencies or errors introduced during the sample selection phase. Characteristics of those who refused to participate or were not home at the time of the survey are unknown. Other possible sources of bias include response bias and recall bias. Bias may also be introduced by the answers of proxy respondents.

Lastly, the generalizability of the findings to all older Americans may be questionable. Since this survey does not include information about institutionalized older persons, significant information about the population, especially older women, may not be represented.

Results: Comparison of subgroups through analysis of factor scores

In order to compare subgroups using this preliminary model of independence, factor scores were produced through multiple regression and saved as variables. The scores have a mean of zero and a variance equal to the squared multiple correlation between the estimated factor scores and the true factor values. Multiple linear regression was used to assess the effect of sex, age, race, ethnicity, marital status, living arrangement, and income (Aim 3) to predict Physical Function, Social Ability, and Physical Health.

Coding. Sex is coded as 1 for males and 0 for females. Age is represented by dummy variables representing five age categories: ages 75-79, 80-84, 85-89, 90-94, and 95-99, with age 70-74 serving as the reference category. Dummy variables for race include: Black, Native American, Asian/Pacific Islander and Other, with White being the reference category. Spanish origin is a dichotomous variable, with non-Hispanic origin

having a value of 0 and Hispanic equal to 1. The reference category for marital status is married - lives with spouse. The five dummy variables for other marital status groups are: married - spouse not in household, widowed, divorced, separated, and never married. The reference for living arrangement is lives with spouse, with dummy variables for lives with relative, lives with nonrelative and lives alone. Income is represented by 8 categories of income, with those having under \$5,000 income per year serving as the reference.

Scatterplots of predicted versus residual values for all three models indicate that assumptions for multivariate normality, linearity and homoscedasticity were met (Polit, 1996). Multiple linear regression results for all three factors are shown in Table 14.

Predictors of physical function. The strongest predictors of physical function are sex and age. Males have a significantly higher level of physical function than females, and as age increases, physical function declines. Physical function is significantly lower for Native Americans. Among marital status categories, physical function is significantly lower for those who are divorced, with widow(er)s narrowly missing statistical significance. For those in income categories \$5,000-6,999 and \$7,000-9,999, physical function is significantly lower than those in other categories, including those who have annual income lower than \$5,000.

Predictors of social ability. Predictors for social ability are obtained through the second regression analysis. Once again, males have significantly higher levels than females, and social ability declines with increasing age. Whites have considerably higher levels than Blacks, Native Americans, Asian/Pacific Islanders and Others, as well as

Hispanics. Those who are married but without a spouse in the household are the only marital group for whom social ability predictors are lower, though those who are separated approach statistical significance. Those who live with relatives have much lower social ability than those with other living arrangements, while those who live alone have statistically significantly higher levels.

Predictors of physical health. Unlike physical function and social ability, males do not have significantly different levels of physical health than females. By age, only those in the 90-94 age group show higher levels of physical health. According to this model, being separated and being in lower income categories are significant predictors of poorer physical health.

Living alone as a proxy for independence. (Aim 4) These data provide partial support for the assumption that living alone is a proxy for independence. Those who live alone have significantly higher scores on social ability than those with other living arrangements. Social ability explains 8.6% of the variance in the model of independence. However, scores on physical function (which explains 29.5% of the variance) for those who live alone are only slightly higher than for other living arrangements and not statistically significant. Those who live alone also have no statistically significant advantage in physical health over those in other categories of living arrangements. Further investigation of this issue is warranted.

Discussion

Results of this regression analysis, based on a preliminary model, support the hypothesis that older community-dwelling women have less independence than their

Table 14. Regression coefficients (standard errors) for regression models predicting Physical Function, Social Ability and Physical Health among respondents in the Second Supplement on Aging (NCHS, 1998).

Independent Variable	Factor 1 Physical Function	Factor 2 Social Ability	Factor 3 Physical Health
Intercept	.116 (.034)	.097 (.030)	.088 (.035)
Sex (male=1)	.165 (.025)***	.119 (.023)***	.022 (.026)
Age group ^a			
75-79	.048 (.028) [†]	-.096 (.025)***	-.035 (.029)
80-84	-.177 (.032)***	-.284 (.029)***	.046 (.033)
85-89	-.430 (.044)***	-.494 (.040)***	-.019 (.045)
90-94	-.835 (.066)***	-.721 (.059)***	.197 (.068)**
95-99	-1.01 (.173)***	-.986 (.155)***	.176 (.178)
Race ^b			
Black	-.041 (.039)	-.494 (.035)***	-.039 (.040)
Native American	-.407 (.158)**	-.529 (.142)***	-.103 (.163)
Asian/Pacific Is.	.172 (.093) [†]	-.722 (.084)***	.141 (.096)
Other	-.060 (.163)	-.615 (.147)***	.302 (.169) [†]
Hispanic	.117 (.063) [†]	-.643 (.057)***	-.125 (.065) [†]
Marital status ^c			
Married (not in hh)	.016 (.104)	-.208 (.094) [†]	-.135 (.107)
Widowed	-.105 (.066) [†]	.021 (.060)	-.108 (.069)
Divorced	-.216 (.083)**	-.025 (.074)	.025 (.085)
Separated	-.009 (.139)	-.216 (.125) [†]	-.321 (.144) [†]
Never married	-.134 (.087)	-.065 (.078)	.032 (.090)
Living arrangement ^d			
With relative	-.114 (.071)	-.497 (.064)***	-.014 (.074)
With nonrelative	-.088 (.151)	.129 (.136)	-.022 (.156)
Lives alone	.080 (.067)	.216 (.060)***	.070 (.069)
Income ^e			
\$5,000-6,999	-.162 (.058)**	-.608 (.053)***	-.229 (.060)***
7,000-9,999	-.037 (.047)	-.422 (.042)***	-.178 (.048)***
10,000-14,999	-.033 (.038)	-.091 (.034)**	-.073 (.039) [†]
15,000-19,999	.006 (.041)	.066 (.037) [†]	-.072 (.042) [†]
20,000-24,999	.016 (.043)	.171 (.039)***	-.055 (.044)
25,000-34,999	.012 (.042)	.366 (.038)***	-.046 (.043)
35,000-49,999	-.049 (.048)	.483 (.044)***	-.079 (.050)
50,000 and over	-.080 (.048) [†]	.742 (.043)***	-.049 (.050)
Model R ²	6.3%	24.5%	1%

^aReference category is age 70-74

^bReference category is White

^cReference category is Married - lives with spouse

^dReference category is Lives with Spouse

^eReference category is Under \$5,000

†.05 < p < .10; *p < .05; **p < .01; ***p < .0001

male counterparts. Women have significantly lower scores on physical function and social ability, factors which account for 38% of the variance in a conceptual model of independence. Furthermore, these data also support the hypothesis that certain subgroups of women are more at risk for loss of (or less) independence based on marital status, race, ethnicity, living arrangement and economic status.

Because this multiple regression was performed on a preliminary model, the results should be considered with caution. Out of three factors retained for the model, physical function probably accounted for most of the variance in the factor analysis model because it had the most robust measures (ADL, IADL, Functional Activity scales). Results (R^2) indicate, however, that only 6.3% of the variability in physical function is explained by these respondent characteristics.

Social ability performed as expected in several groups. One would expect social ability to decline with age, and to be related to living arrangement and income. Differences by race and ethnicity, however, may be due to insensitive measures of social ability for various racial and ethnic groups, and in some cases, may be due to language barriers.

Insignificant differences in physical health by subgroups may be explainable for several reasons. It is possible that there are no significant differences. This, however, is not supported by the literature, where rates of chronic illness are higher for women than for men (Dimond, Catanzaro, & Lorensen, 1997; LaCroix, Newton, Leveille, & Wallace, 1997.) A more likely explanation for the lack of significant difference is that variables contributing to Factor 3 are not adequate indicators of physical health and thus, do not

accurately reflect physical health status. Also, it is possible that those who are in poor health are in settings different from the respondents accessed in this non-institutionalized sample (which might explain the 'increase' in physical health those 90 and above), thus leaving a sample that is healthier. Lastly, it may be that those who manage to reach old age are generally healthy people (Perls and Silver, 1999) and differences between groups are not significant.

The conceptual basis for the study indicates that resources for independence included factors such as choice and control, life experience, and the ability to reciprocate. It also lends support to the notion that availability of family members may be a resource for independence in older persons. Lastly, the influence of political, social, economic and cultural factors on independence are important considerations. The factor analytic model and the regression model are limited by the absence of variables that might have reflected these items.

There are three fundamental criticisms to the study. The first is that if none of us are truly independent, but are rather interdependent, why study the concept of independence at all? One justification for this study is the frequency with which *independence* is used when speaking of older persons in the U.S. Exploration of this concept serves to challenge our assumptions about the meaning of this term, and examine the effects of this expectation for independence on older persons. There may be circumstances under which use of this term is helpful, in that it inspires adherence to health regimens or motivates individuals to recover. It may, however, be harmful in that it establishes unrealistic or unattainable expectations. Analysis of this concept serves to

broaden our thinking about independence, much in the same way that concepts such as well-being, quality-of-life, and health have been reconceptualized.

A second basic criticism is the argument that independence is not measurable. In one sense, this may be true. Even if a sophisticated, well-tested model of independence is developed, individuals still perceive and actualize independence in unique, personal and dynamic ways. There will always be some discrepancy in a definition or model of independence, and in how independence is experienced by the individual. However, as long as clinicians, policymakers and administrators continue to use independence as a goal, it should be measurable and attainable. A model of independence could serve as a basis upon which to direct programs and policies.

A third criticism is that the absence of variables that reflect political, social, and economic factors produce, by default, a model which places a large part of the responsibility for independence on the individual. The reader is reminded that this model of independence is in its preliminary development stage, and that future versions may better reflect not only political, economic and social factors, but ethical dimensions such as choice and control. Ironically, the end result may be a model of independence that indicates that we are not independent at all; that what we call independence is actually our ability to draw on personal and social resources, or to be interdependent.

Despite these limitations, the results of this study contribute to an initial understanding of the concept of independence among older, community-dwelling persons in the U.S. Physical function, social ability and physical health are important contributors to independence in older adults. Based on these preliminary findings, the

following is a working definition of independence (Aim 5): Independence is a dynamic, actual or perceived state in which older persons maintain, adjust, access or exchange physical, social, cognitive, spiritual and economic resources within their environment (physical, political, economic, social and cultural) in order to maximize self-care ability and control over the course of daily life.

Questions such as "What is independence?" and "What is the meaning of independence to older adults" can be answered in many ways. Future exploration of this concept should include contributions from various methodologies which, taken together, can add to our understanding of independence in the lives of older Americans.

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Appendix A

Ideal variables by which to explore factors related to the concept of independence.

- physical function
- ADLs/IADLs
- sensory function
- physical health
- health belief measures
- self-reported health
- social function
- social support network (formal and informal)
- ability to reciprocate
- willingness to be interdependent
- life experience/personal resources
- mental health
- cognitive function
- religiosity/spirituality
- economic status/income
- asset status
- health insurance coverage
- access to health care
- availability of services
- access to community resources
- family support provided
- level education
- occupation history
- work history

Additional desired variables

- age
- sex
- race
- ethnicity
- marital status
- living arrangement
- income

Appendix B

Variables included in the Second Supplement on Aging, 1994, Version 2

- SOA II questionnaire (DFS-3 instrument)
- assistance with ADLs
 - chronic conditions and impairments
 - family structure, relationships, and living arrangements
 - health opinions and behaviors
 - use of health, personal care, and social services
 - use of assistive devices and technologies
 - health insurance
 - housing and long-term care
 - social activity
 - employment history
 - transportation
- Variable fields from the 1994 NHIS Supplements
 - disability phase I variable fields
 - mental health
 - respondent assessed disability
 - access to care
- Second Supplement on Aging Variable Fields
 - administrative data
 - housing and long-term care services
 - transportation
 - social activity
 - work history/employment
 - assistive medical devices, technologies, and implants
 - health insurance
 - assistance with key activities
 - functional limitation
 - ADLs/IADLs
 - person(s) helping with key activities (1st, 2nd, 3rd, 4th helper(s))
 - helper who helps most often
 - activities helped with (by helper)
- Other services
 - visiting nurse
 - personal care attendant
 - adult day care
 - family structure, relationships, and living arrangements
 - conditions and impairments
 - health opinions and behaviors
 - community services
 - proxy status: relationship and reason

Appendix C

Variable descriptions

Variable (highest score)	Coding	Computed scores
1. ADL (Activities of Daily Living) difficulty (none)	Reverse coding. Least number of difficulties (zero) gets highest score.	Score of yes/no answers 'Difficulty... <ul style="list-style-type: none"> • bathing or showering • dressing • eating • getting in/out of bed or chairs • walking • getting outside • using toilet
2. Home difficulty (none)	Reverse coding. Least number of difficulties (zero) gets highest score.	Score of yes/no answers 'Difficulty... <ul style="list-style-type: none"> • entering or leaving your home • with doors in your home • with cabinets in your home • using bathroom in your home
3. IADL (Instrumental Activities of Daily Living) difficulty (none)	Reverse coding. Least number of difficulties (zero) gets highest score.	Score of yes/no answers 'Difficulty... <ul style="list-style-type: none"> • preparing meals • shopping for groceries • managing money • using the telephone • doing heavy housework • doing light housework • getting to outside places • managing medication
4. Functional limitations (none)	Reverse coding. Least number of difficulties (zero) gets highest score.	Score of yes/no answers 'Difficulty... <ul style="list-style-type: none"> • walking for a quarter-mile • walking up 10 steps without resting • standing or being on feet for two hours • sitting for two hours • stooping/crouching/kneeling • reaching up over your head • reaching out as if to shake hands • using fingers to grasp/handle • lifting or carrying 25 pounds • lifting or carrying 10 pounds
5. Receive help with ADLs or IADLs (no)		Sample person receives help or supervision with 1+ ADLs/IADLs 1 = yes 2 = no

Variable (highest score)	Coding	Computed scores
6. Residential improvement needs (none)	Reverse coding. Lowest number of needs (zero) gets highest score.	Score of yes/no answers 'Does residence need': <ul style="list-style-type: none"> • widened doorways or hallways • ramps or street level entrances • railings • automatic or easy doors • accessible parking or drop-off • bathroom modifications • kitchen modifications • elevator or lift or stair glide • alerting devices • other special features
7. DME (Durable Medical Equipment) (none)	Reverse coding. Lowest number of DME used (zero) gets highest score.	Score of yes/no answers 'In the past twelve months, have used': <ul style="list-style-type: none"> • tracheotomy tube • respirator • ostomy bag • catheterization equipment • glucose monitor • diabetic equipment • inhaler • nebulizer • hearing aid • crutches • cane • walker • wheelchair • scooter • feeding tube
8. Fallen in the past year (no)		Have you fallen in the past twelve months? Yes=1 No=2.
9. Social activities in the past two weeks (7)	Highest score indicates highest possible number of social activities (seven).	Score of yes/no answers 'Social activities during the past 2 weeks': <ul style="list-style-type: none"> • get together with friends or neighbors • talk on telephone with friends or neighbors • get together with relatives • talk on telephone with relatives • go to church or temple services • go to movies, sports events, etc. • go out to eat at restaurant
10. Education (18)	Highest level of education receives highest score	Education of individual - completed years. 0 (never attended) through 18 (6 years or more of college).
11. Days left the house in the past two weeks (14)	Highest number of days (14) gets highest score.	

Variable (highest score)	Coding	Computed scores
12. Driving frequency	'Everyday/ almost everyday' gets highest score	Frequency of driving: 0=Never 1=Seldom 2=Occasionally 3=Everyday or almost everyday
13. Mental, emotional, psychiatric problems	Least number of problems (zero) gets highest score.	Score of yes/no answers: <ul style="list-style-type: none"> • frequently depressed or anxious • have a lot of trouble making or keeping friendships • have a lot of trouble getting along in social setting • have trouble concentrating long enough to complete tasks • have serious trouble coping with day-to-day stresses • frequently confused, disoriented, or forgetful • have phobias or unreasonable fears • have schizophrenia in past 12 mos • have paranoid disorder in past 12 mos • have bipolar disorder in past 12 mos • have major depression lasting two or more wks past 12 mos • have antisocial personality, obsessive-compulsive personality, or other personality disorder in past 12 mos • have Alzheimer's or other senility disorder in past 12 mos • have alcohol abuse disorder in past 12 mos • have drug abuse disorder in past 12 mos • have any other mental/emotional disorder in past 12 mos
14. MD visit score (none)	Recoded from continuous to categorical. Reverse coding. Least number of visits (zero) gets highest score.	Doctor visits in the past 12 months 0 = 15 or more visits 1 = 8 to 14 visits 2 = 4 to 7 visits 3 = 1 to 3 visits 4 = no visits
15. Number of Rx's supposed to take (none)	Reverse coding. Least number of prescriptions (zero) gets highest score.	Number of prescription medicines you are supposed to take: 0 = 10 or more 1 = 6 to 9 2 = 3 to 5 3 = 1 or 2 4 = none
16. Bed days last year (none)	Recoded from continuous to categorical. Reverse coding. Least number of days (zero) gets highest score.	0 = 8 or more days 1 = 1 to 7 days 2 = none

Variable (highest score)	Coding	Computed scores
17. Number of conditions reported (none)	Reverse coded. Lowest number (zero) gets highest score.	Number of conditions reported as ever had: <ul style="list-style-type: none"> • broken hip • osteoporosis • diabetes • arthritis • chronic bronchitis or emphysema • asthma • hypertension • heart disease (CAD, angina, MI) • any other heart disease • stroke or CVA • cancer of any kind
18. Activity level compared to one year ago (increased)	Coded so that increased level gets highest score	Level of activity compared to one year ago 0 = less active 1 = about the same 2 = more active
19. Sensory impairments	Coded so that least number of impairments (zero) gets highest score.	Score of yes/no answers <ul style="list-style-type: none"> • cataracts • glaucoma • blindness in both eyes • blindness in one eye • trouble seeing even with glasses (one or both eyes) • use eyeglasses • use contact lenses • ever had operations for cataracts • have lens implant • use magnifying glass to read/do close work • deafness in both ears • deafness in one ear • other trouble hearing with one or both ears
20. Regular exercise routine (yes)		1 = yes 2 = no
21. Self-reported health score	Reverse coded. Highest perception of health gets highest score.	1 = Poor 2 = Fair 3 = Good 4 = Very good 5 = Excellent

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- 1997-1999 Predoctoral student, University of Washington School of Nursing
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