# Epidemiology of Disability in the Oldest Old: Methodologic Issues and Preliminary Findings

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THE RAPID GROWTH OF THE UNITED STATES population 65 years of age and older has been frequently noted. Less well known is the fact that among this elderly group, the proportion of persons aged 85 and older has grown at an unprecedented rate, increasing 165 percent from 1960 to 1982 (Taeuber 1983). In addition, we know the least about existing health problems and impairments for this group; few studies are available which include representative samples of persons aged 85 and older from which estimates of prevalence and incidence of illness and disability might be derived.

The level of physical, social, and cognitive functioning determines the ability of the very old to live comfortably and independently in the community. An association between independent living and the type and severity of limitations is intuitively apparent. However, the threshold for independent living varies and is not clearly understood. We lack knowledge of the interacting factors which influence the

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health and needs of elderly, disabled persons in their own physical and social environment. We must better understand the needs for help from individuals or from community-based services by the disabled elderly, and their needs for institutional care. Gender, cultural, geographic and even cohort differences must and should be studied.

The purpose of this paper is to review available data and describe developing sources of information. We will describe three major prospective studies that have been developed by the National Institute on Aging to provide information on health conditions and impairments of persons 65 years of age and older with representation of persons aged 85 and older. Using these survey data, we will present prevalence information on physical and mental disabilities among the oldest old and their younger elderly peers for each community. These data will also serve to illustrate the limitations of interpretations which must be recognized in cross-sectional studies of the oldest old. The data also emphasize the value of prospective studies of this age group.

#### Review of the Literature

The physical, social, and mental functioning of the elderly has been assessed in a number of national, state, and community surveys, such as the 1975 National Survey of the Aged, the 1979 National Health Interview Home Care Supplement, the Framingham Disability Study, the Massachusetts Elder Study, the 1972 Cleveland GAO Study, and, most recently, the 1982 National Long-Term Care Survey. The Aging Supplement to the 1984 National Health Interview Survey will soon provide additional estimates. Findings from these studies (Shanas et al. 1968; Shanas, 1980, 1982; Nagi 1976; Jette and Branch 1981; Branch and Jette 1981; Feller 1983a, 1983b; Katz et al. 1983; Hanley 1984) consistently show an increase in the limitations of everyday activities with increasing age.

Several studies, such as the Framingham Disability Study, do not include subjects over the age of 84, and others, such as the National Survey of the Aged do not separate data for those aged 85 and over from those aged 80 and over. However, studies which present reliable data for those aged 85 and over do show a dramatic and significant increase in functional limitation for those in this age category as compared with those aged 75 to 84 or even aged 80 to 84. While there are now a number of reliable estimates of national age-specific prevalence rates of physical functioning, personal care activities, and some home management activities for the noninstitutionalized elderly, there is much less information available on transitions from no limitation in activities (independence) to limitation (dependence) in the noninstitutionalized elderly population. Likewise, there is little information on transitions, in both directions, between community dwelling and institutionalization. Studies such as those of Katz et al. (1983) which have charted transitions have generally had insufficient numbers to map adequately the transitions from dependence in functioning to greater independence. Also, self-reported gross physical functioning and rudimentary personal care activities have been more fully assessed than finer physical activities.

Most large-scale studies rely upon self-reporting and do not actually test or observe whether the respondent can actually accomplish the activity. While Shanas (1980) or Jette and Branch (1981) suggest that older-aged women are relatively more incapacitated than men in terms of traditional activities of daily living (ADL), Feller (1983a) generally finds no significant differences between men and women 75 years of age and over in the rate of needing help for at least one basic physical activity. Shanas (1980) finds black elderly women to be the most incapacitated group.

In general, there is very little evidence to show whether the agespecific prevalence of functional limitations for the total elderly population is stable, declining, or increasing. Results from state or community studies (e.g., Jette and Branch 1981) and cross-national studies (e.g., Shanas et. al. 1968; Heikkinen, Waters, and Brzenzinski 1983) show some variation in the age-specific rates. How much of the variation is due to variations in sampling design, instrument sensitivity, differential rates of institutionalization, or actual underlying rates remains an open question.

The 1979 Home Care Supplement to the National Health Interview Survey found that 5.3 percent of adults aged 65 to 74 residing in the community needed the help of another person in one or more basic physical activities including walking, going outside, bathing, dressing, using the toilet, getting in or out of bed or chair, or eating. The rate rose to 11.4 percent for those aged 75 to 84, and to 34.8 percent for those aged 85 and over. The rate of increase was especially steep for women. The percentage rate rose from 5.5 percent for those aged 65 to 74 to 12.1 percent for those aged 75 to 84, and 37.2 percent for those aged 85 and over. The comparable percentage rates for males were 4.9 percent, 10.2 percent, and 30.2 percent. A slightly higher percentage needed help with one or more of the following household management activities: shopping, household chores, handling money, and preparing meals. The percentage needing help with these household management activities increased from 5.7 percent for those aged 65 to 74 to 14.2 percent for those aged 75 to 84, and 39.9 percent for those aged 85 and over. The percentage of females needing help with such activities was significantly higher than for males (Feller 1983b). When the need for help in any activity was considered jointly with incontinence or being bedfast, the percentage (both sexes) needing the help of another person increased from 7.0 percent for those aged 65 to 74, to 16.0 percent for those aged 75 to 84, to 43.7 percent for those aged 85 years and over. For those aged 85 years and over, the rates were 35.4 percent for males and 47.9 percent for females. Those requiring personal care assistance were less likely to be living alone than those requiring home management assistance (Feller 1983b).

The National Long-Term Care Survey required telephone interviews of nearly 36,000 individuals aged over 65 from the Medicare beneficiaries' file in order to provide a nationally representative sample of the noninstitutionalized Medicare population with chronic self-care problems. The preliminary results (Hanley 1984; Manton and Soldo 1985) suggest rough comparability with the 1979 Health Interview Survey, but at somewhat higher rates. In summary, those aged 85 and over were 3 to 5 times more likely to report needs for personal care assistance than the 65 to 74 age group, while they were 5 to 7 times more likely to report needs for household management assistance than the 65 to 74 age group. In most instances elderly females reported a 50 percent greater need for assistance in going outside and shopping, while elderly males reported a higher need for help in using the telephone.

Studies of cognitive impairment in the community have usually been cross-sectional in design and descriptive in purpose (Essen-Moller 1956; Hagnell 1970; Bremer 1951; Hobson and Pemberton 1955; Primrose 1962; Nielsen 1962; Parsons 1965; Williamson et al. 1964; Bollerup 1975; Gilmore 1974; Akesson 1969; Kay, Beamish, and Roth 1964; Kay et al. 1970). Evaluations were usually unstructured and classifications usually by observer opinions. However, some studies have used structured or semistructured assessment instruments, including a cross-sectional study (Pfeiffer 1975) in Durham, North Carolina, a study (Pfeffer et al. 1981) of individuals in a California retirement community, and a cross-national study (Gurland et al. 1983) carried out in New York and London. In addition, several studies (Kay, Beamish, and Roth 1964; Kay et al. 1970; Pfeiffer 1975; Gurland et al. 1983) have included follow-up observations. In most cases the objective was to determine rates of dementia, rather than to identify and assess the extent of cognitive disability. Data for the oldest old are lacking: few representative samples have been examined, few longitudinal studies have been done, and interpretations have been limited by great generational, secular, and cultural differences in education and experience.

# The Development of New Sources of Data

Recognizing the need for data to describe the normal aging process, and the development of chronic disease and impairments in the oldest segment of this country's population, the National Institute on Aging has developed a project titled: "The Establishment of Populations for Epidemiologic Studies of the Elderly" (EPESE) (Cornoni-Huntley et al. 1985). This project consists of three prospective studies of communitybased elderly populations. The goals are to identify predictors of mortality, hospitalization, and placement in long-term care facilities and to study risk factors for common chronic diseases and for disability in this age group. It is anticipated that the information from this research will result in new strategies for the prevention of illness and impairments and will suggest ways to maintain the elderly person's function and independence in the community for as long as possible.

The three populations under investigation are in East Boston, Massachusetts; Iowa and Washington Counties, Iowa; and New Haven, Connecticut. The studies are coordinated, with common design and methodology, and they also have unique investigator-initiated components.

#### East Boston

The East Boston study population consists of all persons living in that community who were 65 years of age and older as of January 1, 1982, as well as persons who reached age 65 during the course of the study. East Boston residents are largely low-middle income, workingclass people of Italian-American background. At the initial enumeration there were 4,485 persons aged 65 and over residing in the community. A response rate of 84 percent yielded a study population of 3,812. Among these individuals were 296 persons 85 years of age or older when they were enrolled (see table 1).

### Iowa and Washington Counties

The Iowa study population consists of all elderly residents in two counties in east central Iowa. The counties contain approximately 4,600 residents aged 65 years and older. There was an 80 percent response rate yielding 3,673 participants. The majority of the target population is classified as rural. One hundred percent of the Iowa county population and 67 percent of Washington county are farm or rural nonfarm dwellers. The remaining 33 percent of the Washington county population reside in a town of approximately 6,000 residents. There are 361 participants aged 85 and older (see table 2).

### New Haven

The New Haven study population is a stratified random sample of 3,420 persons aged 65 and older representing the more than 18,000 elderly New Haven residents. The elderly in New Haven live, for the most part, in three types of housing: (1) public elderly housing, which is age and income restricted; (2) private elderly housing, which

	Mal	es	Fem	ales	Tot	al
Age	Number	Percent	Number	Percent	Number	Percent
65-69	571	39.2%	851	36.4%	1,429	37.5%
7074	397	27.3	628	26.6	1,025	26.9
75–79	252	17.3	425	18.0	677	17.8
80-84	123	8.5	262	11.1	385	10.1
85+	112	7.7	184	7.8	296	7.8
Total	1,455	100.0	2,357	100.0	3,812	100.0

 TABLE 1

 East Boston, Massachusetts Study Population by Age and Sex

	Mal	es	Fema	ales	Tot	al
Age	Number	Percent	Number	Percent	Number	Percent
65–69	428	30.2%	560	24.8%	988	26.9%
70-74	398	28.1	588	26.1	986	26.8
75–79	307	21.7	508	22.5	815	22.2
80-84	164	11.6	359	15.9	523	14.2
85+	120	8.5	241	10.7	361	9.8
Total	1,417	100.0	2,256	100.0	3,673	100.0

 TABLE 2

 Washington and Iowa Counties, Iowa Study Population by Age and Sex

is age restricted; and (3) houses and private apartments. The sampling frame includes a sample drawn from each of these three types of housing arrangements. Since the sample was stratified by housing type with some housing censused and others sampled, and since women were further subsampled, the unweighted data are not representative of the defined elderly population of New Haven. Sampling rates have been assigned to respondents to adjust for deficient sampling response and coverage rates. The weighted data allow us then to draw inferences to the larger defined population of New Haven. The response rate was 82 percent, yielding 2,806 participants, of whom 274 were aged 85 and older. New Haven is a racially mixed community of primarily middle- and low-income residents (see table 3). In all of the accompanying

	Males		Fema	Females		Total*	
Age	Number**	Percent	Number**	Percent	Number**	Percent	
65–69	2,024	36.3%	2,990	30.5%	5,014	32.6%	
70-74	1,498	26.9	2,526	25.8	4,024	26.2	
75-79	992	17.8	2,124	21.7	3,116	20.3	
80-84	602	10.8	1,266	12.9	1,868	12.0	
85+	461	8.3	900	9.2	1,361	8.9	
Total	5,577	100.0	9,806	100.0	15,383	100.0	

 TABLE 3

 New Haven, Connecticut Study Sample by Age and Sex

\* Does not include individuals for whom age is unknown (N = 16).

\*\* Numbers and percents are population estimates, projected from sample data.

tables, the percentages and numbers presented for the New Haven study are population projections, calculated using sampling weights.

### EPESE Study Design

In sum, there are 931 persons aged 85 and older participating in the three studies.

In this prospective study a baseline (prevalence) survey is followed by a 5-year surveillance period. The baseline survey established the populations for further observation and provided estimates of the prevalence of chronic conditions, including cardiovascular disease, diabetes, and respiratory problems. Data on disabilities, physical functioning, the ability to perform daily activities, as well as vision and hearing impairments were obtained. A mental status questionnaire was administered to evaluate cognitive functioning. This initial survey was a household interview and included blood pressure measurements taken by interviewers trained in standardized techniques.

The major study endpoints are mortality, hospitalization, admission to nursing homes or other long-term care facilities, and development of disability. Total and cause-specific mortality is determined using death certificates from state sources supplemented by the National Death Index. Hospitalization experience is determined using Health Care Financing Administration records supplemented by local sources. Admission to nursing homes and other long-term care facilities and the development of disability are measured by self-reports to standardized questions at annual interviews. Proxy information is obtained if the participant cannot supply the necessary data.

Illness involving hospitalization and admission into long-term care facilities reported at all annual interviews are verified through abstraction of information from the facilities' records and from third-party payers. Causes of death will be determined by a single nosologist to maintain standard criteria.

All participants are contacted annually within two weeks of the anniversary of the baseline interview. The first two re-contacts are brief telephone interviews, during which information is obtained on changes in household composition, health status, physical functioning, and episodes of illness, hospitalization, or institutionalization. The next contact with participants is a second interview in the household. Two additional telephone interviews are planned for the last two years of surveillance. Repeated contacts with participants will provide not only information on new episodes of illness, hospitalization, and nursing home admission but also insight into the progression of certain chronic conditions, disabilities, and occurrence of major life changes.

# Physical Disability

Assessing an individual's physical functioning represents only one dimension of a comprehensive functional assessment, which must also touch upon the social, emotional, and mental well-being, particularly among aged individuals (Williams 1983). In general, disability refers to the inability or limitations in performing social roles and activities relative to such situations as work, family, or independent living (Nagi 1976). This latter situation, independent living, is critical to the contentment of individuals in later life, especially those aged 85 and over. In the United States, one-fourth (25 percent) of the women over the age of 85 reside in nursing homes compared to one in seven men (14 percent) from this age group (Hing 1981). Living independently is often threatened by the onset of mentally or physically disabling conditions. Further, the onset of disability is likely to trigger declines in the emotional and social stability of an individual, with increased levels of anxiety, depression, and diminished self-esteem. Disability and social instability are reflected in increasing use of informal supports and increasing levels of need in areas such as housekeeping, transportation, food preparation, and grocery shopping (Branch and Jette 1981). An objective of the EPESE project is to identify and describe health and environmental factors which may affect an individual's ability to maintain a functional and independent lifestyle in the community.

Physical disability is often a consequence of illness or chronic conditions which increase with age. Conceivably, then, a measure of physical disability can act as an index for evaluating the burden of illness and certain chronic diseases in a population. Again, it must be noted that physical disability represents only one facet of functional performance, and while other areas of social, emotional, and mental well-being were tapped in the baseline interviews, only those measures of mental and physical functioning common to all three study sites will be presented. The extent of physical disability may be defined by quantifying limitations in mobility and in the activities of daily living. Rosow and Breslau (1966) have developed and tested a "functional health scale" for measuring disability which scores subjects on 6 questions with "yes" or "no" answers, valued 1 or 0. Possible scale scores range from 0 (very disabled) to 6 (no disability). The full scale includes questions about: a bothersome illness, physical condition, or health problem; heavy work around the house; climbing stairs; going out to a movie, to church, to a meeting, or to visit friends; walking half a mile; and whether an individual is limited in any activity.

Nagi (1976) examined disability among noninstitutionalized adults by asking about the degree of difficulty in performing certain activities including walking, standing for long periods, stooping, bending or kneeling, reading, climbing stairs, and lifting or carrying weights of about 10 pounds. Katz et al. (1983) has developed and validated a scale for measuring the ability to perform activities of daily living (ADL). ADL are defined as bathing, dressing, using the toilet, transferring from bed to chair, continence, and eating. Jette and Branch (1981) used portions of Rosow and Breslau's functional health scale, measures of physical performance adapted from Nagi's work, and a modification of Katz's ADL in the Framingham Disability Study (FDS). The FDS was conducted between 1976 and 1978 and consisted of interviews with more than 2,600 persons between 55 and 84 years of age who were participants in the Heart Disease Epidemiological Study in Framingham, Massachusetts (Dawber, Meadows, and Moore 1951).

The EPESE used fourteen items, derived from the FDS cited above, to construct three indices of physical disability. Three items measure functional mobility, four items measure specific physical activities, and seven items measure ADL:

- 1. Heavy housework (Rosow and Breslau)
- 2. Climbing stairs (Rosow and Breslau)
- 3. Walking half a mile (Rosow and Breslau)
- 4. Pushing large objects (Nagi)
- 5. Stooping, crouching, or kneeling (Nagi)
- 6. Reaching above shoulder level (Nagi)
- 7. Writing or fingering or handling small objects (Nagi)
- 8. Walking (Jette and Branch)

- 9. Bathing (Katz)
- 10. Grooming (Jette and Branch)
- 11. Dressing (Katz)
- 12. Eating (Katz)
- 13. Getting from a bed to a chair (Katz)
- 14. Using the toilet (Katz)

Figures 1 through 3 and tables 4 through 12 present prevalence rates of various levels of disability for each of the three communities. The dark shade in each of the bars represents the most disabled according to each of the indices. The functional-mobility scale results are shown in figure 1. The proportion unable to perform at least one of the



FIG. 1. Prevalence of limitations in functional mobility according to age, sex, and study population (Rosow and Breslau items)

activities was greatest for both sexes among the older age groups. For example, among the Iowa subjects, only 24 percent of the women aged 65 to 74 reported an inability to perform at least one of the activities, whereas among those aged 85 and over, 80 percent were unable to perform at least one activity. In contrast, there were comparatively fewer differences across the age strata among the New Haven males.

Figure 2 displays the physical-activities scale. A large proportion of the oldest old reported difficulty in performing at least one of the physical activities, with rates ranging from 37 percent for the males in New Haven to 83 percent for the females in East Boston. The proportion in each age and sex group reporting difficulty in all four activities was considerably lower. Only in the oldest females of East



FIG. 2. Prevalence of limitations in activities according to age, sex, and study population (Nagi items)

Boston did more than 10 percent of subjects report difficulty in all four activities. None of the oldest males in the Iowa study population reported difficulty in all four activities.

Figure 3 presents the age- and sex-specific prevalence rates of a need for assistance in at least one of the activities of daily living. In general, the proportion of people requiring assistance doubled in each successive age group for each sex. For example, among the East Boston males, the prevalence was 9 percent for those aged 65 to 74, 17 percent for those aged 75 to 84, and 36 percent for those aged 85 and over.

#### Cognitive Disability

While physical disability is usually identified by asking a subject what he can or cannot do (with or without assistance), cognitive disability



FIG. 3. Prevalence of limitations in activities of daily living according to age, sex, and study population

Age and sex	No reported disability	One reported disability	Two reported disabilities	Three reported disabilities	All four reported disabilities	Total number of persons*
MALES						
65-74	73.3%	13.7%	8.0%	3.9%	1.1%	940
75-84	63.1	19.6	9.5	6.6	1.2	347
85 +	43.0	19.8	22.1	5.8	9.3	86
FEMALES						
65-74	54.4	19.7	15.1	8.1	2.8	1,488
75-84	38.3	20.6	21.9	13.4	5.8	635
85 +	17.3	21.8	30.8	18.1	12.0	133

 TABLE 4

 Range of Disability from Nagi's Measures in East Boston

\* Does not include proxy interviews (N = 149), or missing data (N = 34).

is assessed with a test such as a mental status questionnaire (MSQ). The MSQ score then serves as an indicator of the level and quality of cognitive functioning at the time of testing.

The MSQ administered to EPESE participants was derived from Pfeiffer's (1975) "short portable mental status questionnaire," in turn based on an earlier instrument described by Kahn et al. (1960). It consisted of nine questions:

TABLE 5
Range of Disability from a Modified Rosow-Breslau Health Scale
in East Boston

Age and sex	Able to perform all three activities	Unable to perform one of the activities	Unable to perform two of the activities	Unable to perform all three activities	Total number of persons*
MALES					
65-74	68.7%	19.8%	6.8%	4.8%	957
75-84	46.7	30.0	14.3	9.1	364
85 +	20.4	32.4	25.0	22.2	108
FEMALES					
65-74	57.2	23.0	11.4	8.4	1,457
75-84	30.9	25.7	21.9	21.5	666
85+	6.4	18.1	25.2	50.3	171

\* Does not include missing data (N = 89).

	n Total number of persons*	932 354 106 1,418 642 165
UO	Requires assistance in 5, 6, or all ADLs	1.4% 2.0 6.6 1.0 4.5 17.6
ing in East Bost	Requires assistance in 4 ADLs	1.2% 1.1 4.7 3.4 3.4
LE 6 ities of Daily Liv	Requires assistance in 3 ADLs	1.1% 4.7 4.7 3.1 7.9
TABI ' in Katz's Activi	Requires assistance in 2 ADLs	1.4% 3.4 7.6 1.6 8.5 8.5
ange of Disabilit	Requires assistance in one ADL	3.8% 8.8 8.8 12.3 5.3 10.3 16.4
R	No assistance required in any ADL	91.1% 83.3 64.1 90.3 73.8 46.7
	Age and sex	MALES 65-74 65-74 75-84 85 + FEMALES 65-74 75-84 85 +

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\* Does not include missing data (N = 195).

Age and sex	No reported disability	One reported disability	Two reported disabilities	Three reported disabilities	All four reported disabilities	Total number of persons*
MALES						
65–74	73.3%	15.8%	7.9%	1.8%	1.1%	708
75-84	58.2	20.6	11.5	6.0	3.7	383
85+	54.0	20.7	18.4	6.9	0.0	87
FEMALES						
65–74	62.6	21.1	10.9	3.6	1.8	1,036
75-84	43.7	24.9	17.5	9.2	4.7	771
85 +	23.4	26.6	28.7	14.6	6.8	192

 TABLE 7

 Range of Disability from Nagi's Measures in Iowa

\* Does not include proxy interviews (N = 250), interviews conducted by telephone (N = 206), or missing data (N = 40).

- 1. What is the date today?
- 2. What day of the week is it?
- 3. How old are you?
- 4. When were you born?
- 5. Who is the president of the United States?
- 6. Who was president just before him?
- 7. Subtract 3 from 20, and keep subtracting 3 from each new number all the way down.

TABLE 8

Range of Disability from a Modified Rosow-Breslau Health Scale in Iowa

Age and sex	Able to perform all three activities	Unable to perform one of the activities	Unable to perform two of the activities	Unable to perform all three activities	Total number of persons*
MALES					
65-74	73.7%	17.7%	5.8%	2.9%	797
75-84	56.0	21.7	14.1	8.3	448
85 +	26.6	31.0	26.6	15.9	113
FEMALES					
65-74	75.7	14.0	7.0	3.4	1,097
75-84	47.4	25.9	14.1	12.6	792
85+	19.6	24.3	29.9	26.2	214

\* Does not include missing data (N = 212).

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Age and sex	No assistance required in any ADL	Requires assistance in one ADL	Requires assistance in 2 ADLs	Requires assistance in 3 ADLs	Requires assistance in 4 ADLs	Requires assistance in 5, 6, or all ADLs	Total number of persons*
MALES							
65-74	96.5%	1.4%	1.0%	0.3%	0.4%	0.5%	798
7584	91.2	2.6	0.9	0.9	1.3	3.1	455
85+	78.3	8.7	4.4	2.6	2.6	3.5	115
FEMALES							
6574	97.3	1.1	0.5	0.3	0.4	0.5	1,104
75-84	90.1	4.2	1.7	2.0	0.1	1.9	810
85+	77.6	7.5	1.4	2.2	1.8	6.6	228

TABLE 9 Range of Disability in Katz's Activities of Daily Living in Iowa

\* Does not include missing data (N = 163).

Age and sex	No reported disability	One reported disability	Two reported disabilities	Three reported disabilities	All four reported disabilities	Total number of persons*
MALES						
65–74	73.6%	15.6%	7.4%	2.3%	1.1%	3,448
75-84	71.7	14.2	10.9	1.8	1.5	1,519
85+	62.7	16.1	10.4	6.2	4.6	453
FEMALES						
65-74	59.7	19.2	12.7	6.8	1.6	5,396
75-84	47.8	21.1	18.2	8.5	4.4	3,242
85 +	34.4	19.2	25.5	16.1	4.8	855

 TABLE 10

 Range of Disability from Nagi's Measures in New Haven

\* Does not include missing data (N = 470).

8. What is your telephone number (or street address)?

9. What was your mother's maiden name?

Each item was scored as 0 (correct) or 1 ("don't know", refusal, or incorrect answer), giving a possible range of 0 (all correct) through 9 (none correct).

Percentage distributions of MSQ scores for these EPESE participants aged 85 and older are shown in table 13. Four or more errors were

		TABLE 11		
Range of Disability	from a	Modified Rosow-Breslau	Health	Scale
	in	New Haven		

Age and sex	Able to perform all three activities	Unable to perform one of the activities	Unable to perform two of the activities	Unable to perform all three activities	Total number of persons*
MALES					
65-74	74.5%	15.9%	5.2%	4.4%	3,396
75-84	58.9	23.5	9.4	8.2	1,510
85+	41.9	31.5	17.2	9.5	454
FEMALES					
6574	66.1	17.3	8.9	7.6	5,277
75-84	43.7	25.2	15.3	15.8	3,179
85+	19.0	24.5	30.2	26.3	878

\* Does not include missing data (N = 689).

	R	kange of Disability	i Abl. y in Katz's Activi	E 12 ties of Daily Livi	ng in New Haver	Ę	
Age and sex	No assistance required in any ADL	Requires assistance in one ADL	Requires assistance in 2 ADLs	Requires assistance in 3 ADLs	Requires assistance in 4 ADLs	Requires assistance in 5, 6, or all ADLs	Total number of persons*
MALES							
65-74	93.6%	2.7%	1.3%	0.9%	0.9%	0.7%	3,428
75-84	84.2	8.4	2.7	1.3	0.5	3.0	1,545
85+	74.9	7.7	5.4	5.4	2.7	3.9	442
FEMALES							
65-74	92.4	4.3	1.7	0.5	0.2	1.0	5,235
75-84	83.9	7.4	4.0	1.0	1.0	2.7	3,171
85+	62.5	9.3	6.3	12.9	2.0	7.1	847

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\* Does not include missing data (N = 715).

	Years and Older
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				DSM	Score (numt	per of error	s)				
	0	1	2	3	4	5	6	7	8	6	N
EAST BOSTON											
Males	10.1%	18.0%	13.5%	22.5%	14.6%	9.0%	4.5%	3.4%	2.2%	2.2%	89
Females	4.3	15.9	18.1	11.6	15.9	8.7	8.0	9.4	5.8	2.2	138
IOWA											
Males	37.2	31.4	18.6	4.7	3.5	2.3	1.2	1.2	0	0	86
Females	33.0	26.1	17.8	8.5	9.1	3.2	1.6	0.5	0	0	188
NEW HAVEN											
Males	16.6	23.1	24.0	14.1	11.2	4.9	3.6	0.5	0	2.0	446*
Females	18.9	16.8	22.4	10.5	12.1	8.7	5.9	0.7	3.5	0.5	827*

\* These are estimated numbers projected using sampling weights.

made by a substantial proportion of both men and women, with prevalence rates ranging from 8.2 percent (Iowa males) to 50 percent (East Boston female subjects). The performance of subjects grouped according to education, age, and study site is presented in figure 4. With the exception of Iowa's education group C (fewer than 8 years of school completed), the prevalence of high MSQ scores was greatest among the oldest old. High scores were also generally associated with lower educational attainment. Among subjects of similar age and education, high MSQ scores were most prevalent in the East Boston population and least prevalent in Iowa.

# Discussion

For many years epidemiologic and demographic data were reported with an aggregation of persons aged 65 and older. Although information is now being published for older age groups, we still have very few data resources for the oldest old. It is now apparent that even within the oldest groups we should not ignore age-specific variation related to chronic disease, disability, health care utilization, and economic and community health issues.

Analysis of available data sources is currently contributing to a much better understanding of the health status of the elderly. Interpretation of these data, however, requires critical consideration of the study design, sampling, and analytic methodology. The disadvantages of certain approaches are more pronounced in the very old, since certain biases are much more relevant in this group.

The limitations in inferring causality from observations made in cross-sectional studies have been well described. Longitudinal studies such as the EPESE project have several advantages, but methodologic issues deserve careful consideration. Some of these issues seem particularly applicable to the study of older populations. With cross-sectional designs, interpretations are limited by the definition of the sampling frame and possibly the biases of selective survival, nonresponse, and selective recall.

The problem of selective recall may be especially important in the elderly. Health events are likely to be more frequent and therefore to be confused with one another. Memory difficulties experienced by many persons in their later years may account for a large part of



FIG. 4. Prevalence of high MSQ scores according to age, education, and study population

nonreporting of events. In addition, the recall of certain events may be selectively enhanced or triggered by an associated experience.

Elderly nonrespondents (persons who are sampled but decline to participate) are likely to differ from study participants with regard to health characteristics, and these differences may be systematic with regard to age, sex, socioeconomic status, marital status, or other factors. Furthermore, the influence of these factors may differ qualitatively and quantitatively between communities. These considerations serve to emphasize the importance of striving for a high response rate. It is important to obtain as much information as possible on the nonrespondents.

Selective survival results in the elderly being a subset of persons from a larger cohort existing at a previous time. One should be cautious in drawing conclusions from a cross-sectional study of an elderly population since persons with certain characteristics may have been systematically removed from the cohort.

Because institutionalized persons account for a substantial portion of the oldest old, samples drawn from the noninstitutionalized community are likely to be nonrepresentative of the total elderly. This may lead to an underestimation of rates of disability and disease, since the most dependent persons will have been selectively excluded from the sampling frame. Poor health or disability may lead to the elderly person moving out of or into a community. Such changes influence enumeration and identification of individuals in the sampling frame.

The preliminary cross-sectional data presented above, drawn from the three National Institute on Aging's EPESE, must be interpreted with full consideration of the problems just described. Inclusion in the sampling frames and participation in the study imply that study participants may differ from nonparticipants with regard to health characteristics. The prevalence figures presented may well underestimate the true extent of physical disability and cognitive impairment at all three sites.

Physical and cognitive disabilities were most common among the EPESE's oldest old and tended to be more prevalent among women as compared with men at every age. Differences were also observed between the study populations, with both physical and cognitive disabilities generally being least prevalent in Iowa and most common in East Boston.

The meaning of the differences between communities is uncertain. In the Iowa counties, families are smaller, geographically more separated, more highly educated, and more affluent. In East Boston, large families often live in a single dwelling, or family members live close to one another in the neighborhood. The lesser affluence of East Boston may make it more difficult for an elderly person to move to a retirement community or other living situation especially suited for a partially disabled or partially dependent elderly person. It would be reasonable to expect dependent or disabled elderly to remain in the East Boston community substantially longer than might be necessary or possible in the Iowa counties. The situation in New Haven is much more difficult to understand because that study population is more heterogeneous with regard to race, housing type, and socioeconomic status. Because the EPESE data reported here are cross-sectional, and because biases which influence prevalence estimates vary systematically and substantially between communities, it is not now possible to compare the three communities with regard to risks for developing disease and disability. Prospective data will accrue as EPESE subjects are followed longitudinally, and comparative information on the incidence of illness and disability will become available which will offer greater opportunity to compare the elderly of these three geographic areas.

# Conclusion

Both the review of the available data sources and the results presented in this paper point to the value and need for prospective designs in epidemiologic studies of the oldest old. Although prospective studies are certainly more costly and time consuming, these disadvantages are outweighed by the pertinent results which can be produced. The data presented here, generated from the EPESE baseline interviews, exemplify both the value and limitations of using prevalence rates to describe the health and disability of residents of different communities. Even though the period of longitudinal observation for the EPESE is only 6 years, the health endpoints of new disease, disability, and death are occurring at sufficiently high rates that it will soon be possible to evaluate a number of risk factors for these events. Information now being generated by these and similar prospective studies will provide an improved knowledge base for understanding the needs and health care utilization patterns of the oldest old in the United States.

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