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Restricted Activity among Community-Living Older Persons: Incidence, Precipitants, and Health Care Utilization

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Background: **Restricted activity is a potentially important indicator of health and functional status. Yet, relatively little is known about the incidence, precipitants, or health care utilization associated with restricted activity among older persons.**

Objective: **To more accurately estimate the rate of restricted activity among community-living older persons, to identify the health-related and non–health-related problems that lead to restricted activity, and to determine whether restricted activity is associated with increased health care utilization.**

Design: **Prospective cohort study.**

Setting: **New Haven, Connecticut.**

Participants: **754 nondisabled members of a large health plan, 70 years of age or older, who were categorized according to their risk for disability (low, intermediate, or high).**

Measurements: **Occurrence of restricted activity (defined as having stayed in bed for at least half a day or having cut down on one's usual activities because of an illness, injury, or another problem), problems leading to restricted activity, and health care utilization were ascertained during monthly telephone interviews for up to 2 years.**

Results: **In median follow-up of 15 months, 76.6% of participants reported restricted activity during at least 1 month and 39.3% reported restricted activity during 2 consecutive months. The rates of restricted activity per 100 person-months were 19.0 episodes for all participants and 16.9, 27.3, and 22.7 episodes for participants at low, intermediate, and high risk for disability, respectively. Of the 24 prespecified health-related and non–health-related problems, the rates per 100 person-months of restricted activity ranged from 0.1 episode for "problem with alcohol" to 65.5 episodes for "been fatigued." On average, participants identified 4.5 different problems as a cause for their restricted activity. Health care utilization was substantially greater during months with restricted activity than months without restricted activity. The corresponding rates per 100 person-months were 63.8 and 45.1 for physician office visits, 12.5 and 1.0 for emergency department visits, 14.1 and 0.3 for hospital admissions, and 67.6 and 45.1 for any health care utilization ($P < 0.001$ for each pairwise comparison).**

Conclusions: **Restricted activity is common among community-living older persons, regardless of risk for disability, and it is usually attributable to several concurrent health-related problems. Although restricted activity is associated with a substantial increase in health care utilization, older persons with restricted activity often do not seek medical attention.**

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See editorial comment on pp 374-376.

Restricted activity, defined as staying in bed for at least half a day or cutting down on one's usual activities because of an illness or injury (1), has high face validity as a measure of health and functional status, especially for older persons, who often value quality of life over longevity (2). The importance of restricted activity was recognized more than 20 years ago in the U.S. Surgeon General's original Healthy People Report (3), which identified reduction of restricted activity as one of its two major goals for older persons. Subsequently, several clinical trials of preventive interventions have included restricted activity as a key outcome measure (4–7).

Despite this attention, relatively little is known about the epidemiology of restricted activity among older persons. Previous studies, based largely on one-time assessments, have suggested that only a minority of community-living older persons experience restricted activity in the course of 1 year (8, 9). The factors precipitating restricted activity, moreover, have not been well defined. Finally, whether older persons seek medical attention in the setting of restricted activity has not been studied. Those who do not seek attention may consider restricted activity to be a normal part of aging and may miss a chance for successful evaluation and intervention.

In this prospective cohort study, we sought to better elucidate the epidemiology of restricted activity in community-living older persons. Our goals were to more accurately estimate the rate of restricted activity, identify the health-related and non–health-related problems leading to restricted activity, and determine whether restricted activity is associated with increased health care utilization.

METHODS

Study Sample

The study sample comprised the 754 participants of the Precipitating Events Project, a longitudinal study of nondisabled, community-living persons 70 years of age

Table 1. **Risk Model for Disability and Number of Participants Enrolled, according to Phase***

Risk Group	Rapid Gait†	MMSE Score		Age	Enrolled Participants		
					Phase 1	Phase 2	Phase 3
	s			*y*	←——— *n (%)* ———→		
Low	≤10	–		–	274 (77)	158 (47)	0
Intermediate	>10	≥24	AND	<85	56 (16)	121 (36)	37 (62)
High	>10	<24	OR	≥85	26 (7)	59 (17)	23 (38)

* Participants were enrolled in three phases as described in the Methods section. MMSE = Folstein Mini-Mental State Examination (11).
† Participants were asked to walk back and forth over a 10-foot course "as quickly and safely as possible."

or older. Participants in the Precipitating Events Project were identified from a computerized list of 3157 age-eligible members of a large health plan in New Haven, Connecticut. Members were eligible if they were community-living, English-speaking, and nondisabled (that is, required no personal assistance) in four key activities of daily living—bathing, walking, dressing, and transferring from a chair. Plan members were excluded on the basis of three criteria: diagnosis of a terminal illness with a life expectancy less than 12 months, plans to move out of the New Haven area during the next 12 months, and significant cognitive impairment with no available proxy.

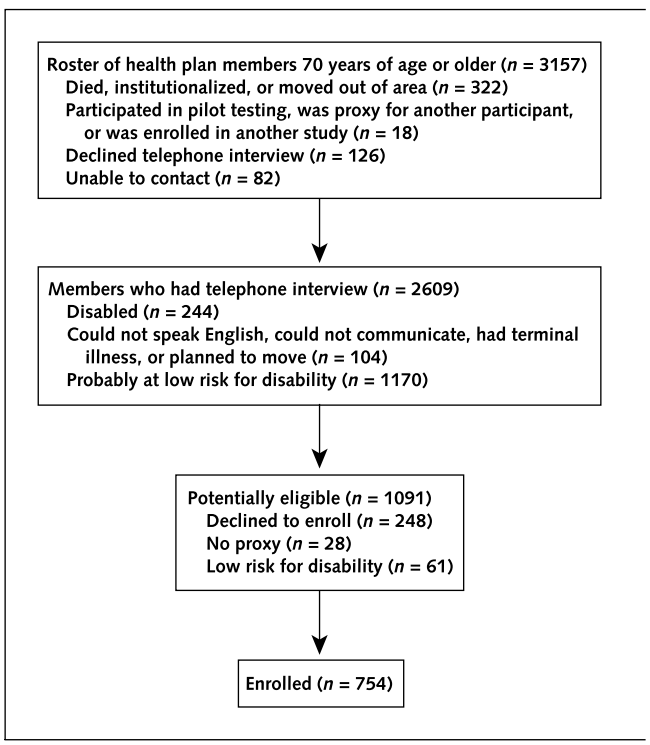
Enrollment

To minimize potential selection effects, a computerized randomization program was used to assign each age-eligible health plan member a unique number. Screening for eligibility and enrollment proceeded sequentially from March 1998 to October 1999. Potential participants were sent a letter that briefly described the study and explained that they would be contacted by phone. During the phone interview, eligibility was assessed, and a home visit was scheduled among consenting eligible persons. During the home visit, eligibility was verified, informed consent was obtained, and a comprehensive baseline assessment was completed. On the basis of gait speed, cognitive status, and age, participants were categorized into one of three risk groups for disability by using a model developed and validated in an earlier study (**Table 1**) (10). To ensure that enough participants were included in each risk group, participants were enrolled in a 4:2:1 ratio for low, intermediate, and high risk for disability, respectively.

Assembly of the Precipitating Events Project cohort is shown in the **Figure**. We applied our stratified sampling strategy in three phases. In phase 1, all eligible and consenting persons were enrolled. In phase 2, persons were excluded from the study if they indicated during the screening telephone interview that they had "walked 0.5 mile or for 30 minutes continuously without stopping within the past month." In phase 3, persons who were eligible based on the screening telephone interview were excluded from the study if they were found to have low risk for disability during the home visit. The enrollment procedures in phases 2 and 3 were otherwise identical to those in phase 1.

The number of participants enrolled in each of the three phases is shown in **Table 1**. During phase 1, 77% of the participants had low risk for disability. Phase 2 was designed to decrease this percentage by excluding persons who were likely to have low risk for disability. The sensitivity and specificity of the screening question used during phase 2 were 66% and 76%, respectively,

Figure. **Assembly of Precipitating Events Project cohort.**



The number of persons excluded for the reasons specified appears in parentheses. Participants were enrolled in a 4:2:1 ratio for low, intermediate, and high risk for disability to ensure that each group had a sufficient number of participants.

for low disability risk (based on "gold standard" data from the first 282 participants enrolled during phase 1). Other candidate screening questions, alone or in combination, had a lower sensitivity or specificity (or both).

As shown in the **Figure**, only 4.6% (126 of 2735) of the health plan members who could be contacted declined to complete the screening telephone interview, and 75.2% (754 of 1002) of the eligible members agreed to participate in the study. Persons who declined to participate did not differ significantly from those who were enrolled in terms of age or sex.

Baseline Data Collection

Trained research nurses used standard instruments to perform baseline interviews and assessments. Clinical data included 13 self-reported, physician-diagnosed chronic conditions: hypertension; myocardial infarction; congestive heart failure; stroke; diabetes; arthritis; hip fracture; fracture of wrist, arm, or spine since 50 years of age; amputation of leg; chronic lung disease; cirrhosis or liver disease; cancer (other than minor skin cancers); and Parkinson disease. Cognitive status was assessed by using the Folstein Mini-Mental State Examination (11). Timed rapid gait was assessed by having the participants walk back and forth over a 10-foot course "as quickly and safely as possible" (10).

Follow-up Data Collection

The occurrence of restricted activity and health-related and non–health-related problems leading to restricted activity were ascertained during monthly telephone interviews by using a standardized, four-step protocol. First, participants were asked two questions related to restricted activity: "Since we last talked on [date of last interview], have you stayed in bed for at least half a day due to an illness, injury, or other problem?" and "Since we last talked on [date of last interview], have you cut down on your usual activities due to an illness, injury, or other problem?" Second, if participants had restricted activity (that is, answered "yes" to either question), they were asked sequentially whether they had had any of 24 prespecified problems "since we last talked on [date of last interview]." To develop our list of potential problems, we identified common physical and mental health symptoms that community-living older persons had reported in previous studies (12–14), and we supplemented these symptoms with other events that we deemed important on the basis of our own clinical and research experience (15).

Third, immediately after each "yes" response to a specific problem, participants were asked, "Did this problem cause you to stay in bed for at least half a day or to cut down on your usual activities?" (that is, did it lead to restricted activity). Finally, participants with restricted activity were asked to specify any other reasons why they stayed in bed for at least half a day or cut down on their usual activities. Participants without restricted activity were not asked about the specific problems. During pilot testing, we found that the test–retest reliability of this four-step protocol was high, with a κ value of 0.90 for the presence or absence of restricted activity and a κ value of 0.75 or greater for the presence or absence of 20 of the 24 problems leading to restricted activity (mean time between assessments, 4.1 days among 20 persons). The κ value was less than 0.6 for only 3 of the problems (swelling in feet or ankles, fear of falling, and frequent or painful urination). During the monthly telephone interviews, participants were also asked whether they had stayed at least overnight in a hospital and whether they had seen a physician in the office or emergency department since their last interview.

The research protocol was approved by the Yale University School of Medicine Institutional Review Board.

Statistical Analysis

We calculated the rate of restricted activity for the overall cohort and for subgroups defined by sex and risk for disability by dividing the number of months in which participants reported staying in bed for at least half a day or cutting down on their usual activities by the total person-months of follow-up. These analyses were repeated for staying in bed for at least half a day and for cutting down on one's usual activities alone (that is, without staying in bed for at least half a day). We then calculated the overall and stratified rates for each of the prespecified problems leading to restricted activity by using person-months with restricted activity as the denominator. The mean number of problems per episode of restricted activity was also calculated. Finally, the rates of health care utilization, including physician office visits, emergency department visits, and hospital admissions, were calculated for months with and months without restricted activity.

The events of interest in this study were potentially

Table 2. **Baseline Characteristics of Study Participants***

Characteristic	Overall (n = 754)	Risk for Disability		
		Low (n = 432)	Intermediate (n = 214)	High (n = 108)
Age, *y*	78.4 ± 5.3	76.9 ± 4.7	78.1 ± 3.8	84.8 ± 5.2
Women, *n (%)*	487 (64.6)	260 (60.2)	155 (72.4)	72 (66.7)
White ethnicity, *n (%)*	682 (90.5)	399 (92.4)	189 (88.3)	94 (87.0)
Education, *y*	12.0 ± 2.9	12.5 ± 2.8	11.7 ± 2.8	10.5 ± 2.9
Living alone, *n (%)*	298 (39.5)	148 (34.3)	100 (46.7)	50 (46.3)
Chronic conditions, *n*	1.9 ± 1.3	1.6 ± 1.2	2.3 ± 1.4	2.0 ± 1.4
MMSE score	26.8 ± 2.5	27.1 ± 2.3	27.3 ± 1.7	24.2 ± 3.0

* Values with the plus/minus sign are the mean ± SD. The overall results represent crude rather than standardized values. MMSE = Folstein Mini-Mental State Examination (11).

recurrent in nature; that is, participants may have experienced restricted activity or used health care services in more than one month. Because standard statistical approaches based on the binomial or Poisson distributions assume independence among events, we used alternative methods, designed specifically for recurrent events, to calculate SEs for rates and means (16, 17). We standardized the overall and sex-specific results by using the distribution of the three risk groups from phase 1 (18), since these participants represented a random sample of our source group of health plan members.

We used the Wald chi-square statistic to compare rates and means across subgroups. For comparison of means, we substituted mean values for rates, as described by Stukel and colleagues (17). The analyses were performed by using SAS software, version 6.12 (19). All statistical tests were two sided.

Table 3. **Rates of Restricted Activity, Stratified by Sex and Risk for Disability***

Characteristic	Restricted Activity	In Bed for Half the Day	Cut Down on Activity
	←——— *episodes/100 person-months* ———→		
Overall†	19.0 ± 0.7	8.8 ± 0.5	10.2 ± 0.4
Sex†			
Male	15.5 ± 0.9	7.2 ± 0.6	8.4 ± 0.6
Female	21.1 ± 0.9	9.8 ± 0.6	11.2 ± 0.6
P value	<0.001	0.003	0.001
Risk for disability			
Low	16.9 ± 0.8	7.5 ± 0.5	9.4 ± 0.5
Intermediate	27.3 ± 1.5	13.1 ± 1.2	14.2 ± 1.0
High	22.7 ± 2.1	13.2 ± 1.6	9.5 ± 1.1
P value	<0.001	<0.001	<0.001

* Values are the mean ± SE.
† Overall and sex-specific results have been standardized to account for the sampling strategy.

Role of the Funding Sources

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RESULTS

The baseline characteristics of participants are shown in **Table 2**. As expected, participants in the high-risk group were older and had lower Mini-Mental State Examination scores than participants in the low- and intermediate-risk groups. Participants in the low-risk group had the highest levels of education and were least likely to be female and to live alone.

Restricted Activity

Median follow-up was 15 months, and the completion rate for the monthly telephone interviews was 97.7%. During follow-up, 76.6% of participants reported restricted activity during at least 1 month and 39.3% reported restricted activity during 2 consecutive months. The corresponding results for participants at low, intermediate, and high risk for disability were 75.7% and 38.4% (median follow-up, 17 months), 82.2% and 47.4% (median follow-up, 13 months), and 73.8% and 31.8% (median follow-up, 12 months); results for women and men were 77.2% and 42.3% (median follow-up, 15 months), and 75.7% and 34.9% (median follow-up, 15 months). Of the 2157 months of restricted activity, 46.0% involved staying in bed for at least half a day and 54.0% involved cutting down on one's usual activities alone.

Table 3 shows rates of restricted activity, staying in bed for at least half a day, and cutting down on usual activities alone, stratified by sex and risk for disability. The overall rate of restricted activity per 100 person-months was 19.0. The rate was significantly lower in persons at low risk for disability than in those at intermediate or high risk (16.9 vs. 25.8; $P < 0.001$) but was significantly higher in women than in men, even after accounting for the greater risk for disability among women ($P < 0.001$). Similar differences in rates were seen for staying in bed for at least half a day and for cutting down on one's usual activities alone.

Problems Leading to Restricted Activity

Among the 24 prespecified health-related and non–health-related problems, the rate per 100 person-months of restricted activity ranged from 0.1 episode for "problem with alcohol" to 65.5 episodes for "been fatigued" (**Table 4**). On average, participants identified 4.5 different problems as a cause for their restricted activity. At least 3 problems were identified for nearly three quarters (70.7%) of the episodes of restricted activity. The mean number of problems per episode of restricted activity increased from 4.1 in the low-risk group to 5.5 in the intermediate-risk group and 6.1 in the high-risk group ($P < 0.001$). Despite this trend, the rates of several problems leading to restricted activity did not statistically differ among the three risk groups. With few exceptions, the specific problems were only weakly correlated with one another. For the first occurrence of restricted activity per participant, for example, correlations of 0.3 or more were found only for "pain or stiff-

Table 4. **Rates of Problems Leading to Restricted Activity, Stratified by Sex and Risk for Disability***

Problem†	Overall (*n* = 581)‡	Sex‡			Risk for Disabilty			
		Male (*n* = 202)	Female (*n* = 379)	*P* Value	Low (*n* = 327)	Intermediate (*n* = 175)	High (*n* = 79)	*P* Value
	←— episodes/100 person-months —→				←— episodes/100 person-months —→			
Been fatigued (no energy/very tired)	65.5 ± 1.4	62.3 ± 2.5	66.9 ± 1.6	0.12	64.4 ± 1.7	68.8 ± 2.0	70.9 ± 3.2	0.1
Pain or stiffness in joints	35.7 ± 1.4	35.4 ± 2.5	35.7 ± 1.6	>0.2	31.9 ± 1.7	47.6 ± 2.5	50.0 ± 3.7	<0.001
Pain or stiffness in back	33.2 ± 1.5	30.5 ± 2.5	34.0 ± 1.8	>0.2	31.3 ± 1.8	40.0 ± 2.6	38.3 ± 3.8	0.01
Been dizzy or unsteady on feet	28.1 ± 1.3	26.6 ± 2.1	28.8 ± 1.7	>0.2	24.5 ± 1.6	36.6 ± 2.2	47.2 ± 3.6	<0.001
Cold or flu symptoms	26.8 ± 1.2	25.9 ± 2.1	27.1 ± 1.5	>0.2	27.0 ± 1.5	24.7 ± 2.0	28.3 ± 2.9	>0.2
Difficulty breathing or shortness of breath	23.1 ± 1.3	22.4 ± 2.2	23.4 ± 1.6	>0.2	19.2 ± 1.5	35.3 ± 2.6	37.9 ± 3.9	<0.001
Been afraid of falling	22.2 ± 1.1	14.6 ± 1.5	25.5 ± 1.5	<0.001	18.3 ± 1.4	32.9 ± 2.2	40.3 ± 3.3	<0.001
Leg pain on walking	21.7 ± 1.2	26.3 ± 2.2	19.5 ± 1.3	0.005	20.2 ± 1.4	26.7 ± 1.9	26.3 ± 2.9	0.01
Difficulty with sleeping	21.6 ± 1.1	18.9 ± 1.8	22.7 ± 1.3	0.1	20.1 ± 1.3	25.6 ± 2.0	28.5 ± 3.1	0.01
Nausea, vomiting, diarrhea, or other stomach (abdominal) problem	19.2 ± 1.1	13.3 ± 1.6	21.8 ± 1.4	<0.001	18.6 ± 1.3	22.3 ± 2.0	18.3 ± 2.7	>0.2
Been depressed	16.2 ± 1.1	12.1 ± 1.7	18.1 ± 1.4	0.01	14.8 ± 1.3	20.7 ± 2.1	20.5 ± 2.6	0.02
Weakness of arms or legs	14.8 ± 0.9	17.7 ± 1.8	13.4 ± 1.0	0.03	11.7 ± 1.1	25.4 ± 1.9	23.9 ± 2.9	<0.001
Been anxious or worried	13.9 ± 0.9	10.2 ± 1.4	15.5 ± 1.2	0.01	12.1 ± 1.1	19.9 ± 2.0	19.8 ± 2.6	<0.001
Swelling in feet or ankles	13.4 ± 0.9	11.0 ± 1.4	14.7 ± 1.2	0.047	10.5 ± 1.0	20.2 ± 1.9	29.4 ± 3.0	<0.001
Chest pain or tightness	11.2 ± 0.8	8.9 ± 1.3	12.0 ± 1.0	0.08	9.9 ± 1.0	13.0 ± 1.6	20.3 ± 3.1	<0.001
Change in medications	10.5 ± 0.8	8.9 ± 1.3	11.2 ± 0.9	0.17	10.6 ± 0.9	10.8 ± 1.2	9.5 ± 2.0	>0.2
Poor or decreased vision	10.3 ± 0.8	8.3 ± 1.3	11.2 ± 1.0	0.09	8.9 ± 0.9	13.0 ± 1.5	18.6 ± 2.5	<0.001
Fall or injury	9.4 ± 0.8	10.1 ± 1.4	9.1 ± 0.9	>0.2	9.4 ± 0.9	9.7 ± 1.3	8.7 ± 1.7	>0.2
Frequent or painful urination	7.4 ± 0.7	10.1 ± 1.3	6.2 ± 0.8	0.006	6.0 ± 0.8	9.6 ± 1.2	16.9 ± 2.5	<0.001
Family member or friend became seriously ill or had an accident	5.8 ± 0.6	3.6 ± 0.8	6.7 ± 0.8	0.01	6.0 ± 0.7	4.4 ± 0.9	5.5 ± 1.5	>0.2
Lost control of urine and wet self	4.5 ± 0.5	3.1 ± 0.8	5.0 ± 0.6	0.08	2.9 ± 0.5	8.7 ± 1.2	12.1 ± 2.3	<0.001
Experienced the death or loss of a family member or friend	3.6 ± 0.4	2.4 ± 0.6	4.2 ± 0.6	0.04	3.8 ± 0.5	2.9 ± 0.6	3.8 ± 1.0	>0.2
Problem with memory or difficulty thinking	3.5 ± 0.5	4.1 ± 0.8	3.3 ± 0.6	>0.2	3.0 ± 0.6	4.7 ± 0.9	6.6 ± 1.6	0.03
Problem with alcohol	0.1 ± 0.0	0.0 ± 0.0	0.1 ± 0.1	–	0.1 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	–
Other reason	27.0 ± 1.2	29.0 ± 2.2	26.2 ± 1.4	>0.2	26.8 ± 1.5	28.1 ± 1.9	27.0 ± 2.8	>0.2

* Includes only participants with at least 1 month of restricted activity. Values are the mean ± SE.
† Presented in order of highest to lowest overall rates.
‡ Overall and sex-specific results have been standardized to account for the sampling strategy.

ness in joints" and "pain or stiffness in back" ($r = 0.31$), for "been depressed" and "been anxious or worried" ($r = 0.51$), and for "family member or friend became seriously ill or had an accident" and "experienced the death or loss of a family member or friend" ($r = 0.32$).

Women identified more problems as a cause for their restricted activity than men did (mean number of problems, 4.6 vs. 4.1), even after the greater risk for disability among women was taken into account ($P = 0.005$). The rates were significantly greater among women than among men for 10 of the 24 prespecified problems (**Table 4**). For 6 of these problems—"been afraid of falling," "nausea, vomiting, diarrhea, or other stomach problem," "been depressed," "been anxious or worried," "family member or friend became seriously ill or had an accident," and "experienced the death or loss of a family member or friend"—women had at least a 50% higher rate than men.

Overall, the most common reasons for restricted activity not included in the prespecified list of problems were weather (for example, too hot, cold, or slippery) (6.6 episodes per 100 person-months of restricted activity); surgery or a complication thereof (4.3 episodes per 100 person-months of restricted activity); cardiac disorder, such as myocardial infarction or congestive heart failure (2.5 episodes per 100 person-months of restricted activity); hospitalization for reason other than surgery, pneumonia, stroke, or cardiac disorder (2.0 episodes per 100 person-months of restricted activity); and respiratory infection, such as pneumonia or bronchitis (1.4 episodes per 100 person-months of restricted activity).

Health Care Utilization

Health care utilization was substantially greater during months with restricted activity than months without restricted activity. The corresponding rates per 100 person-months were 63.8 and 45.1 for physician office visits, 12.5 and 1.0 for emergency department visits, 14.1 and 0.3 for hospital admissions, and 67.6 and 45.1 for any health care utilization ($P < 0.001$ for each comparison). Health care utilization per 100 person-months of restricted activity differed modestly by sex (65.0 episodes for women and 73.4 episodes for men; $P = 0.001$) and risk for disability (66.8, 73.1, and 63.4 episodes for participants at low, intermediate, and high risk, respectively; $P = 0.015$).

Discussion

In this prospective cohort study, we found that restricted activity is common among community-living older persons, regardless of risk for disability, and is usually attributable to several concurrent health-related problems. Furthermore, although restricted activity is associated with a substantial increase in health care utilization, a sizable minority of older persons with restricted activity do not seek medical attention.

To assess restricted activity, we modified the standard definition of staying in bed for at least half a day or cutting down on one's usual activities (1) to include "other problem," in addition to an illness or injury, as a possible contributing factor. It is unlikely that this minor modification greatly increased the rate of restricted activity, since most problems leading to restricted activity were health related. Instead, our intensive ascertainment process, which included monthly telephone interviews, probably produced the high rate of restricted activity. In a previous study that used a single, self-administered questionnaire, only 27% and 26% of older enrollees in a health maintenance organization reported staying in bed for at least half a day and cutting down on their usual activities, respectively, in the past 12 months (8). Because comparable data are not available, we cannot compare the rates of restricted activity in our cohort with those in younger persons.

We found modest differences in the rates of restricted activity according to sex and risk for disability; the highest rates were observed among women and participants with intermediate or high risk for disability. These differences in rates were also observed for staying in bed for at least half a day and for cutting down on one's usual activity alone. Because our model (**Table 1**) was designed to predict the risk for disability rather than for restricted activity, more sizable differences in rates by risk group were not expected. Identifying risk factors for restricted activity should be the focus of future research.

Cutting down on usual activities alone accounted for about half the restricted activity experienced by our participants. This variable depends not only on what activities a person considers to be "usual" but also on his or her subjective judgment about the degree of limitation due to an illness, injury, or other problem. When clinical phenomena are measured, subjective judgments are regarded as essential (20). Moreover, other investi-

gators have found that the two components of the restricted activity definition have similar validity (8, 21). Both the number of days of cutting down on one's usual activities and the number of bed disability days are responsive (that is, sensitive to change) to indicators of worsening health, including hospitalizations, other major illnesses, and worsening of chronic disease scores (21), and each is more highly correlated with measures of physical health and functional limitations than with measures of social and psychological health (8). Nonetheless, participants in the high-risk group had lower rates of cutting down on their usual activities alone ($P = 0.002$) and, hence, lower rates of restricted activity ($P = 0.08$) compared with participants in the intermediate-risk group, suggesting that the most frail older persons may have less opportunity to cut down on their "usual" activities.

Our findings that participants attributed their restricted activity to several different problems and that the number of these problems increased with increasing frailty (that is, risk for disability) suggest that restricted activity may be a multifactorial process similar to that of other geriatric syndromes, such as falling, incontinence, and delirium (22, 23). The most common reasons for restricted activity were fatigue, pain or stiffness in joints, pain or stiffness in back, and dizziness or unsteadiness while standing. Because our protocol did not include a medical assessment, we cannot exclude the possibility that a single disease process underlay several different problems for some participants. The absence of strong correlations between most of the problems, however, suggests that a single disease process was not a common source of restricted activity. The identification of more problems as a cause of restricted activity by women, coupled with their higher rate of restricted activity, is consistent with previous reports demonstrating a higher burden of chronic disease and disability among women than among men (24–26). Taken together, these findings highlight the compelling need for preventive and therapeutic interventions to improve the health and functional status of older women (27).

Because we sought to identify the precipitants of restricted activity rather than to estimate the rate of specific problems, we did not ask participants without restricted activity about specific problems. It is possible that participants might have identified fewer problems as a cause of their restricted activity if we had used an open-ended question. Although routinely used in clinical practice, open-ended questions are often impractical in large epidemiologic studies. Our telephone interviewers are highly trained, but they are not clinicians. Whether nonclinicians can accurately and reliably interpret clinical information in the context of a large epidemiologic study is uncertain. Our protocol for ascertaining potential precipitants of restricted activity has the important advantages of being both standardized and reliable. Participants were explicitly asked whether the specific problems had caused their restricted activity, but a true cause-and-effect relationship cannot be inferred from our data according to strict epidemiologic criteria for causation (28).

For the prespecified problems, we focused primarily on symptoms rather than on diseases for two reasons. First, people usually think in terms of symptoms rather than diseases; in addition, older people do not often seek medical attention for nonurgent symptoms (12, 29) and thus do not receive a disease diagnosis. In a recent study (30), several of the potential problems on our list were rated as either serious or morbid by a random sample of primary care and emergency medicine physicians from the American Medical Association's Physician Masterfile. Because our list of potential problems was finite by necessity, we asked all participants with restricted activity to specify other reasons not on the list for their restricted activity; by doing this, we discovered that the weather was often identified as a contributing factor.

In a cross-sectional study of 11 497 persons 65 years of age or older, Kosorok and colleagues (9) evaluated the association between several self-reported chronic conditions and the number of restricted-activity days in the preceding year. On average, of the 31 restricted-activity days, 6 were associated with falls; 4 were associated with arthritis and rheumatism; 2 each were associated with high blood pressure, cerebrovascular disease, and visual impairment; and 1 each was associated with atherosclerosis, diabetes, major malignant disease, and osteoporosis. Of note, several potentially disabling conditions, including depression, alcoholism, respiratory disease, and dementia, were not evaluated as potential risk factors.

Although participants in our study were more likely to utilize health care services during months with than months without restricted activity, they often did not seek medical attention in the setting of restricted activity. In fact, our results probably overestimate the rate of

health care utilization for restricted activity. As members of a large health plan with established primary care providers, our participants had ready access to the health care system. Furthermore, participants were not asked specifically whether they sought medical attention for their restricted activity. Indeed, participants reported that about one third (32.2%) of their physician visits during months with restricted activity were for routine follow-up. Previous diary studies have shown that older persons seek medical attention for only a small proportion of their symptoms, even when they rate the symptoms as "bad" (12, 13, 31). This phenomenon in which persons perform self-care, including taking nonprescription medications and consulting with family members and friends, rather than seeking medical care, has been called the "iceberg of illness" (32) or "iceberg of morbidity" (13). The large reservoir of symptoms leading to restricted activity, coupled with recent evidence that a coordinated program of self-care may be an effective strategy for managing many chronic conditions and symptoms (33), provides physicians and other health care providers with a unique opportunity to improve the health and well-being of their older patients. Our results, of course, do not establish a causal association between restricted activity and increased health care utilization. In some circumstances, health care utilization may actually precede restricted activity, for example, if a physician recommends bed rest for a flare of sciatica.

Our study has three limitations. First, because our participants were members of a single health plan in a small urban area, our findings may not be generalizable to older persons in other settings. Generalizability, however, depends not only on the choice of a study population but also on the stability of the population over time (34). One of the strengths of our study is the high rate of follow-up; nearly 98% of the monthly telephone interviews were completed successfully. The generalizability of our findings is also enhanced by our high participation rate, which was greater than 75%. Second, we oversampled persons with intermediate and high risk for disability. To account for this sampling strategy, we calculated standardized values for the overall and sex-specific rates of restricted activity and problems leading to restricted activity. Hence, our reported estimates should accurately reflect those of our source population of health plan members. Finally, unlike investigators in previous studies (8, 9), we did not ask participants to estimate the number of days on which they had restricted their activities. To our knowledge, the reliability of these estimates has not yet been determined. Furthermore, other investigators have documented high rates of missing data and a highly skewed distribution for days of restricted activity (8). Instead, we rigorously evaluated the reliability of restricted activity and the problems leading to restricted activity; we found that the reliability for each was high.

Although restricted activity has high face validity as a measure of health and functional status, its ultimate value will probably depend on its association with subsequent disability and functional decline. Further research is needed to determine the short- and long-term consequences of restricted activity among older persons.

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