

# Incidence and Risk Factors for Developing Fear of Falling in Older Adults

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**ABSTRACT** Fear of falling is a potential cause of excess disability and an emerging public health problem. This study explores fear of falling in a longitudinal study of falls to determine incidence, prevalence, and risk factors for developing fear of falling. Prospective cohort study with annual follow-up for 2 years, conducted in a large urban metropolitan area, included 890 community-dwelling older adults—approximately equal numbers in four age groups over the age of 65. Demographic data, falls, injuries, balance, fear of falling, cognition, health, and functional status were collected through annual interviews. The prevalence of fear of falling increased over 2 years from 23 to 43%; the incidence averaged 22.5% in the 2 follow-up years. Having two or more falls, feeling unsteady, and reporting fair or poor health status were independent risk factors for developing fear of falling. The incidence and prevalence of fear of falling is significant among community-dwelling older adults and has the potential to impact function and quality of life. Public health nurses should consider fear of falling in practice, in developing screening and health programs for older adults, and as an important avenue for further research.

Key words: elderly, falls, fear of falling.

Fear of falling has gained increasing attention in the public health literature over the past two decades. The concept was introduced by Murphy and Isaacs (1982) who called it the “post-fall syndrome” and by Bhala, O’Donnell, and Thopil (1982) who used the term “ptophobia.” Since then, the literature has used the term *fear of falling* to describe an exaggerated concern of falling that leads to excess restriction of activities. The fearful older adult narrows their world, resulting in isolation and ultimately physical and functional decline. Fear of falling is common among community-dwelling older adults, with prevalence ranging from 26 to 55% (Arfken, Lach, Birge, & Miller, 1994; Bruce, Devine, & Prince, 2002; Howland et al., 1993, 1998; Murphy, Dubin, & Gill, 2003; Murphy,

Williams, & Gill, 2002; Tinetti, Mendes de Leon, Doucette, & Baker, 1994). Although a higher prevalence of 40–73% has been reported in people who have fallen, studies have shown that up to half of people with fear of falling have not experienced a fall (Arfken et al., 1994; Friedman, Munoz, West, Rubin, & Fried, 2002; Howland et al., 1993; Murphy et al., 2003).

A number of studies have looked at fear of falling from a cross-sectional perspective, showing it to be an important area for research. Fear of falling has been shown to increase with age and to be more prevalent among women than men (Arfken et al., 1994; Friedman et al., 2002; Howland et al., 1993, 1998). Studies have also shown fear to be associated with negative outcomes such as depression and poor life satisfaction, poor mobility, decreased social contact, and decreased quality of life (i.e., Li, Fisher, Harmer, McCauley, & Wilson, 2003). Researchers have demonstrated that people with fear of falling tend to avoid physical activity (Bruce et al., 2002; Vellas, Wayne, Romero, Baumgartner, & Garry, 1997), and restricted mobility may in turn increase the risk of falling.

Murphy et al. (2003) examined predisposing factors to the development of fear of falling in a representative sample of community-dwelling older

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women. Four factors were identified as significant predictors, which include age 80 years or older, visual impairment, sedentary lifestyle, and no available emotional support. They did not find a history of falls within the past year to be an independent predictor of fear of falling, although they did find that subsequent falls when combined with other predisposing factors increased the risk of developing fear of falling. Our study attempts to elaborate on these findings.

Although literature has increased our understanding of the importance of this phenomenon, much is left to learn about how fear of falling develops. As a result, the purpose of this study was to explore the incidence and risk factors for developing fear of falling among older adults. This secondary analysis was conducted on data from a 4-year prospective study of the causes and outcomes of falls in community-dwelling older adults. Fear of falling during 1 year of the study has been reported (Arfken et al., 1994). The purpose of this study was to extend prior work and explore the changes in fear of falling longitudinally in a sample that included both men and women to identify risk factors for developing fear of falling.

## Methods

### *Sample*

Subjects were recruited from St. Louis OASIS, a large community-based program offering enrichment and educational activities for adults aged 60 and older. OASIS had 16,632 members when the study began in 1987. The probability sample was stratified by age and gender to provide approximately equal numbers in four age groups: 65–69, 70–74, 75–79, and 80 years or older. A ratio of 2:1 females to males was randomly selected in each age group, and of the 2,054 selected individuals, 1,358 agreed to participate in Wave 1.

Wave 2 included 890 subjects. From Wave 1, 280 subjects were dropped due to budget cuts (21%) and an additional 188 were lost due to death, moving, or refusal. In Wave 3, 48 subjects dropped out for a sample of 842 participants, and 242 dropped out in Wave 4 so that 600 subjects completed the study.

The investigator did not have data regarding why subjects were lost to follow-up after Wave 2.

Analysis showed that those who dropped out by the last wave were older than subjects who stayed in the study (dropouts had a mean age of 75.5, participants a mean age of 74.7). However, there were no statistically significant differences in health status, number of falls, cognition, depression, or functional characteristics between the two groups. This study includes the subjects who participated in Waves 2 through 4 of the original study.

### *Data Collection*

Subjects were interviewed four times about their health status and experience with falls. The first two interviews were conducted in their homes, and the last two were telephone interviews. Information included demographic characteristics, health status, medications, cognitive function, activity levels, fear of falling, and other potential risk factors for falls. The home interviews included testing for cognition, vision, gait, and balance. Subjects sent in a monthly postcard to track any falls, and the investigators contacted subjects who did not return their postcards. Subjects were interviewed about each fall to verify that a fall occurred (defined as coming to rest on the ground, floor, or object below knee level) and to identify any injuries.

Fear of falling was assessed using a single-item question: “At the present time are you very fearful, somewhat fearful, or not fearful that you might fall (fall again)?” Depression was measured using the 30-item Geriatric Depression Scale (Yesavage et al., 1983), and cognition using the Short Blessed Test (Katzman et al., 1983), and the Trail Making *B* test of cognition and central processing (Reitan, 1958). Normal gait was assessed by measuring time to walk 12 feet and return and balance using a progressive test of parallel, semitandem, and tandem stance with eyes open and closed (Arfken et al., 1994). Vision was assessed using a Rosenbaum card (Lachs et al., 1990).

Additional variables used in this study were assessed by the following single-item interview questions. Health status was determined by asking, “At the present time, would you say that your health is excellent, good, fair, or poor?” Life satisfaction included “In general, how satisfied are you with your life? Would you say that you are very satisfied, somewhat satisfied, or not at all satisfied?” Unsteadiness was reported as “During the past 12 months,

were there times when you lost your balance or felt so unsteady that you thought you might fall, but recovered and didn't actually fall?" Needing help on stairs included "Do you require any assistance in climbing stairs, such as using a handrail or needing the help of another person?" Use of an assistive device was determined by asking, "Do you ever use a cane or walker for assistance in walking?" Social decline was reported through the question: "Do you participate in social activities more, the same or less than when we interviewed you a year ago?" Subjects were asked, "How many blocks can you walk without difficulty?" Less activity was determined by a positive response to the question: "During the past 12 months have you cut down on things you would like to do because of your age?"

### **Data Analysis**

Data were analyzed using the software SPSS (SPSS, Chicago, IL). For analyses, the fear of falling variable was collapsed into a dichotomous variable of fear/no fear. Descriptive characteristics of the sample at Wave 2 were computed, and subjects with fear of falling and without fear of falling were compared using a chi-square test for categorical data and *t* test for continuous variables. Point prevalence rates were computed for Waves 2, 3, and 4 and adjusted using direct standardization to account for the oversampling of females and older subjects (Jekel, Elmore, & Katz, 1996). New cases of fear of falling in Waves 3 and 4 were used to calculate yearly incidence rates for subject with no prior history of fear. The 95% confidence intervals were calculated for the rates at each time point and nonoverlapping confidence intervals were used to indicate statistically significant differences.

Subjects who were not fearful of falling at Wave 2 ( $n = 432$ ) were included in the analysis to identify risk factors for developing fear of falling at Wave 3. First, variables were selected to test for their association with fear of falling based on prior studies. A chi-square test was used for categorical variables and one-way ANOVA for continuous variables. Variables with a significant association with fear of falling were then tested to see whether they were independent risk factors for developing fear of falling. Potential predictor variables were entered into a binary logistic regression analysis as a second block, after adjusting for age and gender. Goodness of fit was tested using

the Hosmer and Lemeshow statistic, which indicates a good fit if the chi-square value is not significant (Hosmer & Lemeshow, 2000). The *C* statistic was used to test the agreement between the actual and predicted values of the regression (Pampel, 2000).

## **Results**

Of the subjects in Wave 2, most were female, and the average age was  $75 \pm 6.2$  years (Table 1). The majority reported good or excellent health status, and there were few limitations in cognition, function, or affect. With the exception of years of education, Short Blessed score, and poor life satisfaction, subjects who were either somewhat or very fearful of falling demonstrated poorer scores or responses to these variables than those who were not fearful of falling.

The percentage of subjects with falls decreased each wave of the study (28%,  $n = 249$ ; 22%,  $n = 185$ ; and 23%,  $n = 138$ , respectively, untabled). Feeling unsteady had a similar pattern. Only 5% ( $n = 44$ ) of subjects suffered a serious injury; 3% ( $n = 27$ ) hip fractures, and 2% ( $n = 17$ ) other injuries.

### **Prevalence and Incidence of Fear of Falling**

Prevalence of fear of falling increased over the two years of the study for each age group (see Table 2). The increases were significant in both waves for the two older age groups, and nearly 56% of those over the age of 80 reported fear of falling. At each wave, females were more likely to be fearful than males. When calculated separately, males and females had significant differences in fear rates between Waves 2 and 4. There were no significant differences between Waves 2 and 3 or Waves 3 and 4 as the confidence intervals overlapped. The incidence averaged 22.5%; the only significant increase was for subjects over the age of 80 who had an increased incidence at Wave 4.

Overall, 56.2% ( $n = 500$ ) had fear of falling at some time during the study, with 17.0% ( $n = 151$ ) always fearful and 43.8% ( $n = 390$ ) never fearful (untabled). Of the subjects who had not fallen, 18% ( $n = 160$ ) reported being fearful of falling. Of note, 18% ( $n = 151$ ) changed and were not fearful at Wave 3, and then 4.5% ( $n = 27$ ) reverted back to being fearful at the last Wave 4. Subjects who stopped being fearful during the study reported lower levels of fear; with 86% ( $n = 130$ ) of those who changed

TABLE 1. Characteristics of Participants With and Without Fear of Falling Wave 2 (N = 890)

Characteristic	Total	Not fearful (n = 639)	Somewhat/very fearful (n = 251)	p Value
Age, mean ± SD*	75.0 ± 6.2	74.5 ± 6.05	76.1 ± 6.05	0.001
Female, %	66	59.9	84.4	0.000
Years of education, mean ± SD*	11.8 ± 3.1	11.9 ± 3.1	11.6 ± 3.2	0.225
Fair/poor health, %	20.9	17.1	30.5	0.000
Short Blessed Test Score, mean ± SD*	1.9 ± 3.3	2.0 ± 3.6	1.7 ± 2.8	0.352
Trail Making B (seconds), mean ± SD*	128.8 ± 38.9	126.4 ± 39.2	135.1 ± 37.7	0.016
Not satisfied with life, %	2.3	2.2	2.5	0.575
Geriatric Depression Score, mean ± SD*	12.0 ± 4.8	12.1 ± 4.8	13.6 ± 5.6	0.000
Use assistive device, %	11.0	6.2	23.4	0.000
Felt unsteady in past year, %	38.2	31.9	54.5	0.000
Balance score, mean ± SD*	4.3 ± 1.1	3.9 ± 1.2	4.5 ± 1.0	0.000
Fall in the past-year percentage	28.0	20.2	33.5	0.009
Fall injury in past-year percentage	5.8	5.1	7.8	0.009
Cut down on activities	15.0	11.1	25.1	0.000
Need help on stairs	7.8	5.8	13.1	0.008

\*Those noted used *t* test for analysis; all others used chi-square test.

TABLE 2. Prevalence and Incidence of Fear of Falling by Age and Gender

Characteristic	Prevalence, % (95% CI)		
	Wave 2 (n = 890)	Wave 3 (n = 842)	Wave 4 (n = 600)
Age group (years)			
65-69	15.2 (12.3-18.1)	24.6 (21.5-28.1)	28.9 (25.3-32.5)
70-74	30.2 (26.5-33.9)	39.5 (35.5-43.4)	44.4 (40.4-48.4)
75-79	32.5 (28.8-36.2)	38.2 (34.3-42.1)	48.9 (44.9-52.9)
80+	32.4 (28.7-36.1)	41.6 (37.7-45.5)	55.6 (51.6-59.6)
Gender			
Female	35.0 (30.3-39.7)	43.0 (38.2-47.8)	52.0 (47.1-56.9)
Male	13.0 (8.3-17.7)	22.0 (16.2-27.8)	28.0 (21.8-34.3)
Adjusted total <sup>†</sup>	30.6 (26.9-34.3)	38.8 (34.9-42.7)	47.2 (43.2-51.2)

  

Characteristic	Incidence, % per year (95% CI)		
	Wave 2*	Wave 3 (n = 432)	Wave 4 (n = 335)
Age (years)			
65-69+	-	17.1 (10.3-23.9)	13.4 (6.6-20.2)
70-74	-	23.9 (16.0-31.8)	24.4 (15.3-33.5)
75-79	-	18.9 (11.5-26.4)	22.1 (13.3-30.9)
80+	-	31.2 (22.0-40.4)	55.6 (51.6-59.6)
Gender			
Female	-	26.1 (20.8-31.4)	26.9 (20.6-33.2)
Male	-	16.9 (11.3-22.5)	16.2 (10.1-22.3)
Adjusted total <sup>†</sup>	-	24.3 (20.9-27.7)	24.8 (21.3-28.3)

\*Incidence could not be calculated at Wave 2.

<sup>†</sup>The total adjusted rates are calculated to provide rates per 100 of the OASIS population, which was 80% female at the time of recruitment.

being “somewhat fearful” and only 14% ( $n = 21$ ) “very fearful.”

### ***Risk Factors for Developing Fear of Falling***

Bivariate analysis was used to identify variables significantly associated with fear of falling for use in the regression. Results of the regression identified three risk factors for developing fear of falling: worse health status, feeling unsteady, and having two or more falls (Table 3). Subjects with fair to poor health were 1.72 times more likely to develop fear of falling than subjects with good health. Subjects who felt unsteady were 1.88 times more likely to report fear of falling than those who felt steady. Subjects who had two or more falls had more than four times the likelihood of reporting fear of falling than subjects with only one or no falls.

The  $C$  statistic was 0.713, which demonstrated the Receiver Operating Characteristic (ROC) curve for this model and fit within the acceptable range (Hosmer & Lemeshow, 2000). Overall, the model classified 81.7% of subjects correctly. The sensitivity was acceptable at 64%, indicating that there were few false negatives, but there were a high number of false positives, so the specificity was poor (18%). The Hosmer and Lemeshow goodness of fit for this model was insignificant, with the  $\chi^2(8, n = 432) = 3.837$ ,  $p = 0.872$ , indicating a good fit for this model.

## **Discussion**

This study used longitudinal data, allowing for the calculation of incidence of fear of falling as well as prospective analysis of risk factors for developing fear of falling. Incidence is an important component of understanding the epidemiology of fear of falling. The incidence was 22.6 and 22.4% in the two time points indicating new cases of fear of falling among those who were not previously fearful. The rate for women of 26% was similar to the 27% found by Murphy et al. (2003). This rate indicates that fear of falling is a problem for a significant number of older adults. Knowing that fear of falling changes over time, researchers should use caution in studying fear of falling at only one time point because of the temporal instability of the problem.

The variables found to be associated with fear of falling in this study support the cross-sectional studies already in the literature. Fear of falling was associated with having falls and falls with injuries, which has been reported before. As in prior studies, a significant number of subjects in this study had no history of a fall (18%). Fear of falling continued to be more common in women and to increase with age.

Logistic regression models identified variables that predict the development of fear of falling, not just evaluate variables associated with it. Although many factors are associated with fear of falling, only

TABLE 3. *Multivariate Logistic Regression with Development of Fear of Falling as Dependent Variable ( $n = 432$ )*

Variable	$B$	Odds ratio	95% CI
<b>Step 1</b>			
Female gender	0.12	2.39	1.28–4.46*
Age over 75	–0.01	0.98	0.49–1.94
<b>Step 2</b>			
Health status	0.11	1.72	1.12–2.66*
Trail Making $B$	0.06	1.01	0.99–1.01
Unsteady in past year	0.09	1.88	1.06–3.37*
Needing help on stairs	0.01	1.03	0.51–2.05
Use of an assistive device	–0.05	0.11	0.14–1.56
Decline in social activities	–0.04	0.58	0.17–1.98
Number of blocks that can be walked	–0.02	0.98	0.89–1.08
Cut down on activities	–0.06	0.53	0.24–1.17
Balance score	0.02	1.06	0.79–1.43
Two or more falls past year	0.21	3.90	1.14–13.37*

\*Significant at the 0.05 level.

Coefficients were standardized using the Long formula (Pampel, 2000).  $C = 0.713$ , goodness-of-fit statistic,  $\chi^2(8, n = 432) = 3.837$ ,  $p = 0.872$ .

a few variables were independently associated with its development: having two or more falls, poorer self-rated health, and feeling unsteady. Gender was the most important covariate.

It was anticipated that falling would be related to developing fear of falling, as this variable is the most closely related to the outcome and a common finding. Friedman et al. (2002) found falls and fear of falling both predictive of each other. In this analysis, having two or more falls was a significant predictor of fear of falling. Many older adults have a single fall, often related to an unexpected environmental challenge, but multiple falls tend to indicate chronic, intrinsic physical problems. Other researchers have found that having multiple falls increase the risk of a number of other negative outcomes including injury and mortality (Nevitt, Cummings, Kidd, & Black, 1989). Although further study of the development of fear of falling is needed, the significant variables noted in this analysis suggest clinical features that identify people at risk for developing fear of falling. Women with balance and gait difficulty resulting in unsteadiness, multiple falls, and low self-rated health are at greatest risk.

Feeling unsteady was another significant predictor of developing fear of falling. Fear of falling is associated with balance performance (Hatch, Gill-Body, & Portney, 2003) and fear of falling may actually contribute to a high-risk gait (Maki, 1997). Yardley (1998) extensively studied fear of falling among subjects with dizziness and balance disorders and proposed that dizziness produces autonomic arousal that creates anxiety. These findings suggest a mechanism for how feeling unsteady contributes to the development of fear of falling. Fear of falling has been reported as the most important concern for community-dwelling older adults, even more than fear of being robbed, experiencing financial difficulty, or having a serious health problem (Howland et al., 1993).

Poor self-rated health has been associated with outcomes including mortality, increased health service utilization, and falls (Fessel & Nevitt, 1997). This self-report measure describes self-perception of health status and is a general measure of well-being. Low ratings of health may be associated with physical and functional decline that has been associated with fear of falling (Friedman et al., 2002; Lawrence, Tennstedt, Kasten, Howland, & Jette, 1998).

The findings of this study were somewhat different compared to the findings reported by Murphy

et al. (2003). Our study incorporates both males and females as opposed to their study, which includes females only. In addition, the age range of Murphy et al.'s sample was less variable and older. This study incorporates a wider age range and therefore used age as a covariate, because fear of falling has been shown to increase with age. These demographic disparities could account for the differences noted when contrasting the two studies. Murphy et al. did not find falls to be predictive of fear of falling. We looked at the frequency of falls and found multiple falls of two or more to be predictive of developing fear of falling.

Nurses and other health professionals in contact with community older adults have the opportunity to assess for fear of falling and its risk factors. A general screening for fear of falling and falls, especially multiple falls, unsteadiness, and poor self-rated health among older women, is indicated. Many of the interventions for falls could be implemented for patients found to be at risk. For example, as unsteadiness is a risk factor for falls and developing fear of falling, assessment and treatment for this problem should be recommended. Medical evaluation and treatment, gait assessment, therapy, exercises, or assistive devices might be appropriate.

Fear of falling has the potential to impact older adults in terms of morbidity and quality of life. Public health nurses should consider fear of falling when developing screening and health programs for community-dwelling elders. Fear of falling should be considered for inclusion in existing and new programs. Educational and exercise interventions for fear of falling are beginning to be studied (Brouwer, Walker, Rydahl, & Culham, 2003; Taggart, 2002; Tennstedt et al., 1998), and additional measures to prevent and treat fear of falling should be developed and evaluated.

This study was a secondary analysis, a methodology that has some inherent limitations (Jacobson, Hamilton, & Galloway, 1993). In this case, the variable for fear of falling was a single, self-report item. Since the original design of this study, several measures of fear of falling have been reported in the literature that may provide more detailed information about the phenomenon. Other variables explored in this study might have been measured in more comprehensive ways, such as activities of daily living. In this case, separate items were asked, and the dichotomous or categorical nature of many of the variables limited the kind of analyses that could be

performed. Age of the data set also can be a concern in secondary analysis, as health and health care are rapidly changing fields. Because few longitudinal studies have published incidence of or risk factors for fear of falling, this secondary data analysis is an appropriate examination.

In this study, only 44% of the sample from Wave 1 completed the study, even though 21% were dropped intentionally. Because baseline information was available on the entire sample, the investigator was able to compare those who were cut and dropouts with the final participants. Although those who dropped out were older than those who stayed in the study, there were no other significant baseline differences. However, those who dropped out of the study might have had greater fear of falling, more falls, and overall, a different profile than those who stayed in the study. In addition, the sample was drawn from members of an educational program in one urban area. Generalization to the larger population of older adults must be done with caution.

In summary, this study confirms that fear of falling is a common concern for community-dwelling older adults. This study supports prior findings indicating that fear of falling is associated with poor physical and mental health outcomes. The prevalence and incidence are significant, supporting the need for screening and interventions for older adults in the community setting. Several factors related to developing fear of falling have been identified and can be used to assess and identify risk factors for its development. Additional research is needed to understand its impact in other populations, particularly minorities, and to identify early indicators, so that preventive measures can be instituted before fear of falling becomes a problem.

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