

Elder Self-neglect and Abuse and Mortality Risk in a Community-Dwelling Population

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ELDER SELF-NEGLECT AND ABUSE are serious, common, and underrecognized public health issues. Title XX of the Social Security Act, signed into law in 1975, mandates states to develop and maintain protective services agencies for these vulnerable older adults. In 2004, the United States spent an estimated \$500 million on these social services agencies.^{1,2} However, large gaps remain in understanding elder self-neglect and abuse. There are an estimated 2 million cases of elder self-neglect and abuse in the United States.^{3,4} According to the National Center on Elder Abuse, self-neglect is defined “. . . as the behavior of an elderly person that threatens his/her own health and safety.”⁵ Elder abuse is defined as “an act referring to any knowing, intentional, or negligent act by a caregiver or any other person that causes harm or a serious risk of harm to a vulnerable adult.”⁵ The World Health Organization has declared that elder abuse is a violation of one of the most basic fundamental rights of a human being to be safe and free of violence.⁶

See also p 570 and Patient Page.

Context Both elder self-neglect and abuse have become increasingly prominent public health issues. The association of either elder self-neglect or abuse with mortality remains unclear.

Objective To examine the relationship of elder self-neglect or abuse reported to social services agencies with all-cause mortality among a community-dwelling elderly population.

Design, Setting, and Participants Prospective, population-based cohort study (conducted from 1993 to 2005) of residents living in a geographically defined community of 3 adjacent neighborhoods in Chicago, Illinois, who were participating in the Chicago Health and Aging Project (CHAP; a longitudinal, population-based, epidemiological study of residents aged ≥ 65 years). A subset of these participants had suspected elder self-neglect or abuse reported to social services agencies.

Main Outcome Measures Mortality ascertained during follow-up and by use of the National Death Index. Cox proportional hazard models were used to assess independent associations of self-neglect or elder abuse reporting with the risk of all-cause mortality using time-varying covariate analyses.

Results Of 9318 CHAP participants, 1544 participants were reported for elder self-neglect and 113 participants were reported for elder abuse from 1993 to 2005. All CHAP participants were followed up for a median of 6.9 years (interquartile range, 7.4 years), during which 4306 deaths occurred. In multivariable analyses, reported elder self-neglect was associated with a significantly increased risk of 1-year mortality (hazard ratio [HR], 5.82; 95% confidence interval [CI], 5.20-6.51). Mortality risk was lower but still elevated after 1 year (HR, 1.88; 95% CI, 1.67-2.14). Reported elder abuse also was associated with significantly increased risk of overall mortality (HR, 1.39; 95% CI, 1.07-1.84). Confirmed elder self-neglect or abuse also was associated with mortality. Increased mortality risks associated with either elder self-neglect or abuse were not restricted to those with the lowest levels of cognitive or physical function.

Conclusion Both elder self-neglect and abuse reported to social services agencies were associated with increased risk of mortality.

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A 2000 survey from social service agencies suggests that reports of elder self-neglect and abuse are increasing.⁷ This trend is particularly alarming because the literature suggests that elder self-neglect and abuse may be associated with adverse health outcomes.^{8,9} Furthermore, the US National Research Council has urgently called for rigorous and systematic research on these issues, especially through population-based epidemiological studies,⁴ because current understanding of the con-

sequences of elder self-neglect and abuse in the general population remains limited. In addition, elder self-neglect and

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abuse have traditionally been thought to be more common among the most vulnerable individuals, especially those with the most impaired cognitive and physical function. However, there is little information about the adverse health consequences of elder self-neglect or abuse across different levels of cognitive and physical function.

In this article, we investigate the risk of mortality associated with reported elder self-neglect or abuse in a large and sociodemographically diverse cohort and across different levels of cognitive and physical function.

METHODS

Design and Participants

The Chicago Health and Aging Project (CHAP) is a prospective, population-based study of a geographically defined, urban, biracial community population. The CHAP study was designed to identify risk factors for Alzheimer disease and other common chronic health problems in older age. Details of the study design have been described previously.^{10,11}

Briefly, the study enrolled residents aged 65 years or older living in 3 adjacent neighborhoods on the south side of Chicago, Illinois. In 1993, the study began with a complete census of the community area. The census identified 7813 age-eligible residents, 6158 (78.9%) of whom were enrolled between 1993 and 1997 as the original cohort. In 2000, CHAP began to enroll additional participants from the study community who had turned age 65 years since inception of the study as successive age cohorts. Data collection occurs in 3-year cycles, with each follow-up cycle beginning after the conclusion of the previous cycle. The follow-up participation rate averages 80% to 85% of survivors for each cycle. Each data collection cycle includes an in-person interview that comprised the assessment of health history, physical function, cognitive function, health behaviors, and psychosocial factors.

The CHAP study population is urban, racially/ethnically and socioeconomically diverse, and has been well

characterized, with up to 14 years of detailed information on many relevant background variables, permitting in-depth examination of potential confounders. As of 2005, a total of 9318 participants had participated in CHAP. Written informed consent was obtained from all participants and the study was approved by the institutional review board at Rush University Medical Center in Chicago, Illinois.

Reporting of Elder Self-neglect and Abuse

Reports of suspected elder self-neglect or abuse to social services agencies can come from a variety of sources, including health care and legal professionals, community organizations, city workers (postal worker, utility worker, etc), family members, or concerned neighbors or friends who have contact with elderly individuals. In Illinois, self-neglect is not mandated for reporting. Self-neglect generally manifests itself in an older person as a refusal or failure to provide himself/herself with adequate food, water, clothing, shelter, personal hygiene, medication (when indicated), and safety precautions.⁴ When a suspected elder self-neglect case is reported, home assessment is performed, in which the concerns for unmet personal health and safety needs are considered. These unmet needs are scored on a continuum of severity (score range, 0-45), which are then categorized as either confirmed (score range, 1-45) or unconfirmed (score of 0) self-neglect. A confirmed self-neglect case was subsequently ranked with respect to severity as mild (score range, 1-15), moderate (score range, 16-30), or severe (score range, 30-45). Details of this measure have been previously described.¹² Available information¹³ indicates good interrater reliability ($\kappa \geq 0.70$) and internal consistency (Cronbach coefficient $\alpha = .95$).

In Illinois, suspected elder abuse is only partially mandated for reporting (ie, only for those who are unable to report the abuse for themselves and for whom abuse has occurred within the last 12

months). Types of elder abuse include physical abuse, sexual abuse, emotional abuse, confinement, caregiver neglect, deprivation, and financial exploitation. Physical abuse is defined as inflicting physical pain or injury upon an older adult. Sexual abuse is touching, fondling, intercourse, or any other sexual activity with an older adult when the older adult is unable to understand, unwilling to consent, threatened, or physically forced. Emotional abuse involves verbal assaults, threat of abuse, harassment, or intimidation. Confinement is restraining or isolating an older adult, other than for medical reasons. Neglect is a caregiver's failure to provide an older adult with life's necessities, including but not limited to food, clothing, shelter, or medical care. The difference between caregiver neglect and elder self-neglect is the presence or the absence of a formal or informal caregiver. Willful deprivation is defined as denying medication, medical care, shelter, food, a therapeutic device, or other physical assistance. Financial exploitation includes the misuse or withholding of an older individual's resources by another to the disadvantage of the elderly person or the profit or advantage of someone else. When a suspected elder abuse case is reported, home assessment is performed, in which case managers assess the presence of specific indicators of elder abuse. From this assessment, a reported case is then designated as confirmed or unconfirmed elder abuse. Details of the indicators of elder abuse have been previously described.¹⁴

Data Set Matching

We matched data from CHAP participants to suspected elder self-neglect and abuse cases reported to social services agencies from January 1, 1993, to October 1, 2005. Matching was based on an algorithm that compared date of birth, sex, race, exact home address, zip codes, and the home telephone number and was performed twice to increase accuracy. This resulted in a total of 1544 CHAP participants who matched a social service agency record. If a CHAP participant was found

to be reported more than once, we selected the first report. For the present study, we only used self-neglect cases and abuse cases that were reported to social services agencies after the baseline CHAP interview.

Study Variables

Data on vital status were obtained from informants at regular follow-up contact and through newspaper obituaries. Reported deaths were cross-checked with the National Death Index, which verified the date of death, and the National Death Index Plus, which provided the specific cause of death. We used all-cause mortality as the primary end point and cause-specific mortality as the secondary end point.

Demographic variables included age (in years), sex, race (self-reported as non-Hispanic black vs non-Hispanic white; included as a variable because race has been shown to be a significant predictor for self-neglect or abuse reporting^{15,16}), income, and education (years of education completed). A cohort indicator was defined according to baseline participation in either the original cohort or the successive age cohorts. Cigarette smoking (ever smoked) and alcohol use (>12 drinks in the last 12 months) were assessed based on a series of questions derived from the Established Populations for Epidemiological Studies of the Elderly project.¹⁷ Symptoms of depression were measured using a modified version¹⁸ of the Center for Epidemiologic Studies Depression Scale (score range, 0-10).¹⁹ Data on self-reported, physician-diagnosed medical conditions were collected for hypertension, diabetes mellitus, stroke, cardiovascular disease, hip fracture, cancer, Parkinson disease, and thyroid disease.

Cognitive function was assessed using the Mini-Mental State Examination (MMSE),²⁰ immediate and delayed recall of brief stories in the East Boston Memory Test,²¹ and the Symbol Digit Modalities Test.²² To assess global cognitive function with minimal floor and ceiling artifacts, we constructed a summary measure for global

cognition based on all 4 tests. Individual test scores were summarized by first transforming a person's score on each individual test to a *z* score and then averaging the *z* scores across tests to yield a composite score for global cognitive function.

Physical function was assessed by direct performance testing, which is thought to provide a more objective and detailed assessment of certain abilities (score range, 0-15)²³ than self-report. It assesses walking speed, tandem stand ability, and repeated chair-stand ability. Associations between measures of reported disability and physical performance tests are usually strong,²⁴ and physical performance tests have been used to confirm self-report measures.²³ In addition, self-reported physical function was assessed by 2 measures. The Katz Activities of Daily Living (ADL) scale measures limitations in an individual's ability to perform basic self-care tasks.²⁵ It consists of 6 items and an ADL score is created by adding the individual items (score range, 0-6). The second self-reported measure was an index of basic physical activities, and is based on work by Nagi.²⁶ It measures 5 self-reported activities of upper or lower extremity function. Each item is scored according to degree of difficulty on a 5-point scale (score range, 0-5). Weight loss was objectively assessed by the repeated weight measures from different CHAP population interviews. Social network was summarized as the total number of children, relatives, and friends seen at least monthly.¹⁷ These characteristics were collected prior to the report of elder self-neglect or abuse. The median lag time between the assessment of the above characteristics and reporting was 1.6 years (interquartile range [IQR], 1.8 years) for elder self-neglect and 1.5 years (IQR, 1.8 years) for elder abuse.

Analytic Approach

Participants were divided into 3 groups: elder self-neglect, elder abuse, or neither. In this study, because reports of elder self-neglect and abuse occurred throughout the study period of 1993 to

2005, groups were modeled as a time-varying covariate²⁷ in a series of Cox proportional hazards models,²⁸ which were used to examine their association with mortality. In the primary model (model A), we tested the association of reported self-neglect or abuse with mortality risk after adjustment for cohort, age, sex, race, education, income, and marital status. We tested 2-way and 3-way interactions of these core variables and retained those with statistical significance in the primary model. In the second model (model B), we added health-related variables of medical comorbidities, global cognitive function, Katz ADL, Nagi physical performance testing, weight loss, alcohol use (>12 drinks in last 12 months), and ever smoking. In the third model (model C), we added symptoms of depression and social network. In addition, we repeated the above analyses (models A-C) for cause-specific mortalities due to cardiovascular, pulmonary, digestive, infectious, metabolic, endocrine, and neuropsychiatric disorders, and neoplastic diseases.

We further examined the association between reported elder self-neglect or abuse and all-cause mortality in 3 additional ways, each time repeating the models described above. First, after stratification for level of cognitive and physical function, we used tertiles of the commonly used MMSE measure for cognitive function and tertiles of repeated chair-stand ability for physical function. Next, we considered confirmed elder self-neglect or abuse. Lastly, we examined the mortality risk across different levels of self-neglect severity.

Mortality for reported elder self-neglect and abuse were recorded as crude deaths per 100 person-years. Medical conditions, cognitive function, and physical function were modeled as time-dependent variables in our analyses. Hazard ratio (HR) and 95% confidence intervals (CIs) are reported. The time-variant analyses for elder abuse were proportional in the test for model fit. Due to sharply increased

death rates in the first year after reported elder self-neglect and the substantial mortality differences in the original cohort or the successive age cohorts, the HRs for elder self-neglect were not proportional. To adequately confront these issues, we added original cohort and successive age cohorts as a covariate. In addition, we divided time to death after reported elder self-neglect into 2 time intervals of 12 months or less and greater than 12 months. Model fit for this approach was examined and was found to be good. All analyses used 2-sided alternatives with a *P* value of less than .05 considered significant. Study power to de-

tect an HR of 1.3 was greater than 99%. All analyses were performed using the PROC PHREG procedure in SAS version 9.2 (SAS Institute Inc, Cary, North Carolina).²⁹

RESULTS

Baseline Characteristics

The 9318 CHAP participants had a mean (SD) age of 73.2 (6.9) years. About 40% were men, 63% were black, and the mean (SD) education was 12.2 (3.6) years. Those cases reported as elder self-neglect (*n* = 1544) and elder abuse (*n* = 113) tended to be older, female, black, and have a lower income and education (TABLE 1). There were 4306

deaths (46.2%) during the 14 years of follow-up (median [IQR], 6.9 [7.4] years). Among those with reported elder self-neglect, there were 927 deaths (47.8%) during a median (IQR) follow-up of 0.8 (0.3-2.3) years. Among those with reported elder abuse, there were 69 deaths (61.1%) during a median (IQR) follow-up of 2.7 (0.8-5.0) years.

Elder Self-neglect and Mortality

One-year mortality for participants with reported self-neglect was 270.36 deaths per 100 person-years and mortality for participants after 1 year was 9.46 deaths per 100 person-years. The mortality for participants without self-neglect report was 5.01 deaths per 100 person-years. In the fully adjusted analysis (model C in TABLE 2), reported self-neglect was associated with a significantly increased risk of 1-year mortality (HR, 5.82; 95% CI, 5.20-6.51). Mortality risk after 1 year was lower, but remained increased (HR, 1.88; 95% CI, 1.67-2.14). White participants (unadjusted HR, 1.16 [95% CI, 1.09-1.24]; fully adjusted HR, 1.63 [95% CI, 1.49-1.78]) and men (unadjusted HR, 1.24 [95% CI, 1.16-1.31]; fully adjusted HR, 1.72 [95% CI, 1.58-1.87]) had a higher risk of mortality relative to others.

One-year mortality for participants with confirmed self-neglect (*n* = 1231) was 279.04 deaths per 100 person-years and mortality for participants after 1 year was 10.42 deaths per 100 person-years. In the fully adjusted analysis (model C in TABLE 3), confirmed elder self-neglect was significantly associated with increased risk of mortality (HR, 5.76; 95% CI, 5.11-6.49). Mortality risk after 1 year remained significant for confirmed elder self-neglect (HR, 1.87; 95% CI, 1.64-2.14).

In addition, we examined the mortality risk among those with confirmed elder self-neglect across the different levels of self-neglect severity (Table 3). In the fully adjusted analysis (model C), mortality at 1 year was increased for mild self-neglect (HR, 4.71; 95% CI, 3.59-6.17), moderate self-neglect (HR, 5.87; 95% CI, 5.12-6.73), and severe self-neglect (HR,

Table 1. Characteristics of Elders Reported for Self-neglect or Abuse in a Community-Dwelling Population^a

	Self-neglect (<i>n</i> = 1544)	Elder Abuse (<i>n</i> = 113)	Neither (<i>n</i> = 7728)
Age, mean (SD), y	73.7 (6.6)	75.3 (6.8)	73.1 (7.0)
Male sex	530 (34.3)	20 (17.7)	3169 (41.0)
Black race	1356 (87.8)	102 (90.3)	4515 (58.4)
Education (years completed), mean (SD)	11.1 (3.4)	10.2 (3.3)	12.4 (3.6)
Yearly income, \$ ^b			
0-9999	416 (26.9)	33 (29.2)	1025 (13.3)
10 000-19 000	549 (35.6)	51 (45.1)	1944 (25.1)
20 000-29 999	297 (19.2)	12 (10.6)	1553 (20.1)
≥30 000	202 (13.1)	9 (8.0)	2230 (28.9)
Married	708 (45.9)	35 (30.9)	3914 (50.6)
Weight loss, mean (SD), kg	1.6 (4.3)	1.7 (4.8)	<1.0 (3.2)
Cigarette smoking (ever)	849 (55.0)	49 (43.4)	4149 (53.7)
Alcohol use (>12 drinks in last 12 mo)	331 (21.4)	20 (17.7)	2808 (36.3)
Medical conditions			
Cardiovascular disease	283 (18.3)	24 (21.2)	1123 (14.5)
Hypertension	999 (64.7)	69 (61.1)	4417 (57.2)
Cancer	302 (19.6)	15 (13.3)	1476 (19.1)
Stroke	207 (13.4)	22 (19.5)	754 (9.8)
Thyroid disease	105 (6.8)	4 (3.5)	394 (5.1)
Diabetes mellitus	413 (26.7)	35 (31.0)	1501 (19.4)
Parkinson disease	18 (1.2)	2 (1.8)	84 (1.1)
Hip fracture	54 (3.5)	5 (4.4)	291 (3.8)
Test scores, mean (SD)			
Mini-Mental State Examination (score range, 0-30)	25.2 (5.1)	23.8 (5.2)	26.2 (5.2)
Global cognition (score range, -4.31 to 1.93)	-0.09 (0.81)	-0.36 (0.80)	0.19 (0.84)
Katz impairment (score range, 0-6)	0.4 (1.2)	0.7 (1.4)	0.3 (1.1)
Nagi impairment (score range, 0-5)	1.4 (1.5)	1.6 (1.6)	0.9 (1.4)
Physical performance (score range, 0-15)	8.99 (3.82)	7.53 (4.32)	10.48 (3.69)
Center for Epidemiologic Studies Depression Scale (score range, 0-10)	2.0 (2.3)	2.5 (2.6)	1.5 (1.9)
Median (25-75th percentiles)	1 (0-3)	2 (0-4)	1 (0-2)
Social network (score range, 0-81)	6.9 (5.9)	5.6 (4.8)	7.5 (6.4)

^aValues are expressed as number (percentage) unless otherwise indicated.

^bMissing data for 80 individuals in the elder self-neglect group, 8 individuals in the elder abuse group, and 976 individuals in the neither group.

15.47; 95% CI, 11.18-21.41) in a dose-dependent fashion. Mortality risk after 1 year remained significant for mild, moderate, and severe cases of elder self-neglect (Table 3). Because of increased mortality risk in whites and men, we assessed whether blacks and women tended to have less severe self-neglect ratings (suggesting that the threshold for reporting was lower). This was not the case; the mean (SD) severity score for self-neglect was 20.6 (7.0) for blacks vs 20.9 (7.7) for whites (t score, 0.51; $P=.61$) and 20.7 (6.6) for women vs 20.7 (7.9) for men (t score, 0; $P>.99$).

Elder Abuse and Mortality

The mortality rate for participants without reported elder abuse was 5.91 deaths per 100 person-years and for

those with reported elder abuse was 13.49 deaths per 100 person-years following the report. In the fully adjusted analysis (model C in Table 2), reported elder abuse was significantly associated with increased risk of overall mortality (HR, 1.39; 95% CI, 1.07-1.84). The mortality for the participants with confirmed elder abuse ($n=61$) was 18.33 deaths per 100 person-years. In the fully adjusted analysis (model C in Table 3), confirmed elder abuse was associated with greater increased risk of mortality (HR, 2.06; 95% CI, 1.48-2.88).

Elder Self-neglect and Mortality Stratified by Cognitive and Physical Function

Reported elder self-neglect was associated with increased mortality at all lev-

els of cognitive and physical function. In analyses stratified by tertiles of MMSE scores, reported elder self-neglect was associated with increased 1-year mortality in both the lowest (score <20; adjusted HR, 7.96; 95% CI, 6.08-10.42) and highest (score 26-30; adjusted HR, 6.37; 95% CI, 5.42-7.48) tertiles (TABLE 4). In the physical function analyses stratified by repeated chair-stand ability, reported self-neglect also was associated with significantly increased 1-year mortality in both the lowest (0-1 times; adjusted HR, 7.15; 95% CI, 5.97-8.57) and highest (4-5 times; adjusted HR, 8.82; 95% CI, 6.89-11.28) tertiles. For the confirmed cases of elder self-neglect, mortality risk remained significant across all levels of cognitive and physical function (Table 4).

Table 2. Association of Reported Elder Self-neglect or Abuse With All-Cause Mortality^a

	Hazard Ratio (95% Confidence Interval)					
	Reported Elder Self-neglect ^b			Reported Elder Abuse ^c		
	Model A	Model B	Model C	Model A	Model B	Model C
Cohort ^d	0.72 (0.63-0.81)	0.71 (0.62-0.81)	0.91 (0.62-0.80)	0.79 (0.71-0.89)	0.79 (0.69-0.89)	0.79 (0.69-0.89)
Age per y (mean, 75 y)	1.08 (1.07-1.09)	1.04 (1.04-1.05)	1.04 (1.04-1.05)	1.09 (1.08-1.09)	1.05 (1.04-1.05)	1.05 (1.04-1.05)
Male sex	1.70 (1.58-1.83)	1.72 (1.58-1.88)	1.72 (1.58-1.87)	1.69 (1.57-1.82)	1.75 (1.60-1.90)	1.74 (1.59-1.89)
Black race	0.82 (0.76-0.89)	0.61 (0.56-0.67)	0.61 (0.56-0.67)	0.95 (0.88-1.03)	0.68 (0.63-0.74)	0.68 (0.62-0.74)
Education per y (mean completion, 12 y)	0.97 (0.96-0.99)	1.02 (1.00-1.03)	1.02 (1.00-1.03)	0.97 (0.96-0.98)	1.02 (1.00-1.03)	1.02 (1.00-1.03)
Mean income	0.95 (0.93-0.99)	0.98 (0.96-1.00)	0.98 (0.96-1.00)	0.93 (0.91-0.95)	0.97 (0.95-0.99)	0.97 (0.95-0.98)
Age × education	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Sex × education	1.02 (1.01-1.04)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	1.03 (1.01-1.04)	0.99 (0.97-1.01)	0.99 (0.97-1.01)
Married	0.91 (0.93-0.96)	0.95 (0.88-1.04)	0.95 (0.88-1.04)	0.93 (0.86-1.01)	0.98 (0.89-1.06)	0.98 (0.90-1.07)
Weight loss per kg		0.98 (0.98-0.99)	0.98 (0.86-1.02)		0.98 (0.98-0.99)	0.98 (0.98-0.99)
Cigarette smoking (ever)		1.31 (1.22-1.42)	1.31 (1.22-1.42)		1.36 (1.26-1.46)	1.36 (1.26-1.47)
Alcohol use (>12 drinks in last 12 mo)		0.93 (0.98-0.99)	0.94 (0.86-1.02)		0.91 (0.84-0.99)	0.92 (0.84-0.99)
Medical conditions		1.14 (1.10-1.18)	1.14 (1.10-1.18)		1.15 (1.11-1.19)	1.15 (1.12-1.19)
Test scores ^e						
Global cognition		0.71 (0.68-0.74)	0.71 (0.68-0.74)		0.71 (0.68-0.74)	0.71 (0.68-0.74)
Katz impairment		1.06 (1.02-1.11)	1.07 (1.02-1.11)		1.05 (1.01-1.09)	1.06 (1.01-1.10)
Nagi impairment		1.02 (0.99-1.05)	1.02 (0.99-1.05)		1.03 (1.00-1.06)	1.03 (0.99-1.06)
Physical performance		0.92 (0.91-0.93)	0.92 (0.91-0.93)		0.91 (0.90-0.92)	0.91 (0.90-0.92)
Center for Epidemiologic Studies Depression Scale			1.00 (0.98-1.02)			1.00 (0.98-1.02)
Social network			0.99 (0.99-1.00)			0.99 (0.99-1.00)
Reported self-neglect						
1-y follow-up	7.50 (6.77-8.30)	5.84 (5.23-6.53)	5.82 (5.20-6.51)			
>1-y follow-up	2.36 (2.11-2.62)	1.88 (1.67-2.14)	1.88 (1.67-2.14)			
Reported elder abuse				1.77 (1.38-2.28) ^f	1.43 (1.08-1.85) ^g	1.39 (1.07-1.84) ^g

^aLower scores for continuous variables correspond with lower cognition or impairment and higher scores correspond to higher cognition or impairment. See "Methods" section for explanation of what was tested in models A, B, and C.

^bAssociation between mortality risk and reported elder self-neglect occurs during the first year of follow-up.

^cAssociation between mortality risk and reported elder abuse occurs after the first year of follow-up.

^dRefers to the original cohort or the successive cohort of the Chicago Health and Aging Project (CHAP).

^eThe incremental change refers to the unit increase in the score. The ranges for these scores appear in Table 1.

^fIndicates $P<.001$ for comparison.

^gIndicates $P<.05$ for comparison.

Table 3. Association of Confirmed Elder Self-neglect or Abuse With All-Cause Mortality

	Hazard Ratio (95% Confidence Interval) ^a		
	Model A	Model B	Model C
Confirmed elder self-neglect			
≤1 y follow-up	7.71 (6.92-8.59)	5.79 (5.14-6.52)	5.76 (5.11-6.49)
>1 y follow-up	2.36 (2.09-2.68)	1.87 (1.64-2.14)	1.87 (1.64-2.14)
Severity ^b			
≤1 y; Mild	5.46 (4.24-7.03)	4.69 (3.58-6.14)	4.71 (3.59-6.17)
>1 y; Mild	2.07 (1.63-2.63)	1.99 (1.53-2.59)	1.99 (1.53-2.58)
≤1 y; Moderate	8.25 (7.29-9.34)	5.92 (5.17-6.78)	5.87 (5.12-6.73)
>1 y; Moderate	2.67 (2.10-3.39)	1.95 (1.50-2.54)	1.90 (1.51-2.54)
≤1 y; Severe	16.99 (12.62-22.85)	15.36 (11.09-21.25)	15.47 (11.18-21.41)
>1 y; Severe	2.84 (2.24-3.60)	2.04 (1.57-2.65)	2.04 (1.57-2.64)
Confirmed elder abuse	2.39 (1.76-3.28)	2.08 (1.49-2.89)	2.06 (1.48-2.88)

^aSee "Methods" section for explanation of what was tested in models A, B, and C.

^b $P < .001$ for the confirmed elder self-neglect severity comparisons.

Elder Abuse and Mortality Stratified by Cognitive and Physical Function

Results of stratified analysis showed that the significantly increased mortality associated with elder abuse was not restricted solely to the lowest levels of cognitive function and physical function. In analyses stratified by tertiles of MMSE scores, confirmed elder abuse was associated with increased mortality risk in both the lowest (score <20; adjusted HR, 2.38; 95% CI, 1.23-4.62) and middle (score 20-25; adjusted HR, 2.50; 95% CI, 1.47-4.25) tertiles (TABLE 5). In the physical function analyses stratified by repeated chair-stand ability, confirmed elder abuse was also associated with increased mortality risk in both the lowest (0-1 times; adjusted HR, 2.35; 95% CI, 1.45-3.81) and middle (2-3 times; adjusted HR, 2.51; 95% CI, 1.47-4.29) tertiles. Mortality risk associated with confirmed elder abuse was not associated with significantly increased mortality among those within the highest strata of cognitive or physical function, although the small sample size limited the power to detect an association in this subgroup.

Elder Self-neglect or Abuse and Cause-Specific Mortality

Analyses of cause-specific mortality for self-neglect did not show an association limited to any single cause of death. In the fully adjusted analyses, reported elder self-neglect was associ-

ated with an increased mortality risk in cardiovascular, pulmonary, neuropsychiatric, endocrine or metabolic, and neoplasm-related death (TABLE 6). For cases of elder abuse, we were only able to assess cardiovascular-related mortality and found that reported elder abuse (HR, 2.32; 95% CI, 1.40-3.83) and confirmed elder abuse (HR, 3.86; 95% CI, 2.04-7.29) were both associated with increased risk of cardiovascular-related mortality.

COMMENT

Reports of elder self-neglect or abuse are often initiated based on significant concerns for an older person's welfare, health, and safety, perhaps to levels that suggest that there may be strong concerns for the older person's well-being. These reports trigger the involvement of agencies to investigate whether elder self-neglect or abuse has actually occurred. The sensitivity and specificity of these reports and the investigations' mechanisms are largely unknown. Elder self-neglect and abuse are underreported, especially with less egregious cases. The National Elder Abuse Incidence Study indicates that only 1 of 14 cases of elder abuse is reported to social services agencies.⁵ At the same time, not all reported cases may actually represent elder self-neglect or abuse; and not all unconfirmed cases represent complete lack of evidence. Many unconfirmed cases represent partial or complete inability to

gather evidence for confirmation due to lack of cooperation from elders or family members and/or are limited by agency resources. Other unconfirmed cases represent situations in which, despite the suspicions occasioning a report, there is no evidence of elder self-neglect or abuse.

In several clinical case series, elder self-neglect and abuse have been found to be associated with high mortality, but these studies were based on small samples and did not have comparison groups.³⁰⁻³⁴ In the only other population-based study to date,⁸ a total of 128 cases of self-neglect and 78 cases of elder abuse were identified from 1982-1992 through linkage between the New Haven Established Populations for Epidemiological Studies of the Elderly cohort and records from a Connecticut social services agency. After a total of 13 years of follow-up, 21% of the elder self-neglect cases and 9% of elder abuse cases survived compared with 40% of the noncases, yielding an approximately 2-fold increased mortality risk for elder self-neglect and a 3-fold increased mortality risk for elder abuse after adjusting for confounding factors.

Elder Self-neglect and Mortality

Our findings on elder self-neglect extend this study by demonstrating that the mortality risk is associated with both reported and confirmed self-neglect. This mortality risk is especially alarming during the first year after the report of elder self-neglect. These findings may have direct implications for health care professionals and social services agencies to promote early identification of elder self-neglect and prompt interventions after the discovery of self-neglect. In addition, this study is the first, to our knowledge, to demonstrate increased mortality risk for reported and confirmed elder self-neglect across different levels of cognitive and physical function, challenging a belief that self-neglect and the potential for adverse health outcomes are confined to those with the most impaired cognitive and physical func-

tion. Rather, our findings suggest that even among those individuals with milder levels of cognitive and physical functional impairment, elder self-neglect is associated with substantially increased risk of death.

The causal pathways remain unclear for the association between elder self-neglect and mortality, particularly the substantial increase in 1-year mortality. Our findings indicate the mortality risk associated with reported and confirmed self-neglect is not isolated to any specific

cause, rather it occurs across the common principal causes of death. We considered a comprehensive series of potential confounders, but adjustment for these factors did not substantially change the associations. Although it is possible that these mortality risks may occur among the frailest elders near the end of their lives, we believe it is unlikely. The mean (SD) number of self-reported medical conditions among those reported for elder self-neglect was 1.5 (1.5), ADL impairments was 0.4 (1.2; range,

0-6), and MMSE score was 25.2 (5.1; range, 0-30); all of which were measured a mean of 1.6 years before the self-neglect report, suggesting a nonfrail group. Clinical experience suggests that those who self-neglect often may not recognize or refuse to recognize the dangers of their self-neglectful behaviors and often only encounter the emergency health care system after a catastrophic event has occurred. Case reports^{30-32,35,36} often describe self-neglectors presenting to the health care system with organ failure, se-

Table 4. Reported and Confirmed Elder Self-neglect Stratified by Cognitive Function and Physical Function^a

	Total No.	Reported Self-neglect, No. (%)		No Abuse Reported, Deaths per 100 Person-Years	Reported Self-neglect		Adjusted HR (95% CI) ^b	P Value
		Mortality	Cases		Mortality Intervals, y	Deaths per 100 Person-Years		
Cognitive function tertiles for MMSE								
Group 1 (score <20)	864	725 (83.9)	264 (30.6)	12.09	≤1	256.67	7.96 (6.08-10.42)	<.001
					>1	20.63	5.28 (3.71-7.54)	<.001
Group 2 (score 20-25)	1797	1063 (59.2)	460 (26.6)	6.29	≤1	279.27	5.28 (4.32-6.44)	<.001
					>1	12.39	2.18 (1.78-2.69)	<.001
Group 3 (score 26-30)	6352	2308 (36.3)	776 (12.2)	3.89	≤1	282.25	6.37 (5.42-7.48)	<.001
					>1	6.08	1.33 (1.11-1.60)	<.001
Physical function tertiles for repeated chair stands								
Group 1 (0-1 times)	1904	1264 (66.4)	660 (34.7)	7.84	≤1	257.91	7.15 (5.97-8.57)	<.001
					>1	12.25	2.84 (2.28-3.56)	<.001
Group 2 (2-3 times)	3145	1406 (44.7)	451 (14.3)	4.84	≤1	272.33	6.31 (5.16-7.72)	<.001
					>1	8.52	1.62 (1.31-2.01)	<.001
Group 3 (4-5 times)	3711	1213 (32.7)	326 (8.8)	3.50	≤1	310.61	8.82 (6.89-11.28)	<.001
					>1	5.77	1.45 (1.10-1.92)	.004
	Total No.	Confirmed Self-neglect, %		No Confirmed Abuse, Deaths per 100 Person-Years	Confirmed Self-neglect		Adjusted HR (95% CI) ^b	P Value
		Mortality	Cases		Mortality Intervals, y	Deaths per 100 Person-Years		
Cognitive function tertiles for MMSE								
Group 1 (score <20)	864	725 (83.9)	228 (26.4)	12.53	≤1	266.15	6.98 (5.29-9.21)	<.001
					>1	21.34	4.50 (3.13-6.48)	<.001
Group 2 (score 20-25)	1797	1063 (59.2)	373 (20.8)	6.49	≤1	289.86	5.29 (4.27-6.54)	<.001
					>1	13.61	2.18 (1.75-2.71)	<.001
Group 3 (score 26-30)	6352	2308 (36.3)	592 (9.3)	3.97	≤1	289.06	6.35 (5.34-7.55)	<.001
					>1	6.58	1.26 (1.03-1.55)	.01
Physical function tertiles for repeated chair stands								
Group 1 (0-1 times)	1904	1264 (66.4)	567 (29.8)	8.21	≤1	265.96	6.33 (5.26-7.63)	<.001
					>1	12.71	2.49 (1.99-3.14)	<.001
Group 2 (2-3 times)	3145	1406 (44.7)	339 (10.8)	4.95	≤1	289.61	6.52 (5.24-8.11)	<.001
					>1	9.35	1.54 (1.22-1.95)	<.001
Group 3 (4-5 times)	3711	1213 (32.7)	235 (6.3)	3.55	≤1	303.07	9.79 (7.51-12.75)	<.001
					>1	6.69	1.64 (1.21-2.23)	<.001

Abbreviations: CI, confidence interval; HR, hazard ratio; MMSE, Mini-Mental State Examination.

^aThe reference categories for the stratified analyses are those participants in each of the cognitive function or physical function categories who did not have reported or confirmed elder self-neglect or elder abuse. The MMSE was excluded in the stratified analyses of cognitive function and the chair stand was excluded in the stratified analyses of physical function. Low levels of cognitive or physical function correspond to group 1 and high levels correspond to group 3.

^bAdjusted for age, sex, race, education (years completed), income, age × education, sex × education, medical conditions, MMSE score, chair stand, marital status, weight loss, alcohol use (>12 drinks in last 12 months), cigarette smoking (ever), Center for Epidemiologic Studies Depression score, and social network.

vere nutritional deficiencies and metabolic abnormalities, and undiagnosed advanced cancer, which are all associated with a high mortality risk.

We found that both reported and confirmed elder self-neglect among individuals with higher levels of cognitive

and physical function were associated with increased mortality risk, especially during the first year. Self-neglectors with higher levels of cognitive and physical function may refuse suggested interventions by health care professionals and social services agencies,

which then respect the elder's autonomy and rights to self-determination and will not intervene any further. Moreover, few health care professionals have direct observation of the self-neglector's home environment to further assess the severity of self-neglect.

Table 5. Reported and Confirmed Elder Abuse Stratified by Cognitive Function and Physical Function^a

	Total No.	No. (%)		Deaths per 100 Person-Years		Adjusted HR (95% CI) ^b	P Value
		Mortality	Reported Abuse	No Abuse Reported	Reported Abuse		
Cognitive function tertiles for MMSE							
Group 1 (score <20)	770	650 (84.4)	26 (3.4)	17.29	22.68	1.46 (0.85-2.52)	.17
Group 2 (score 20-25)	1741	1013 (58.2)	44 (2.5)	7.73	14.71	1.61 (1.06-2.45)	.03
Group 3 (score 26-30)	6476	2417 (37.3)	37 (0.6)	4.48	7.73	1.04 (0.61-1.77)	.89
Physical function tertiles for chair stands							
Group 1 (0-1 times)	1616	1056 (65.3)	53 (3.3)	11.52	15.69	1.43 (0.96-2.14)	.08
Group 2 (2-3 times)	3306	1515 (45.8)	37 (1.1)	5.57	12.04	1.78 (1.13-2.78)	.01
Group 3 (4-5 times)	3819	1291 (33.8)	14 (0.4)	3.93	6.45	1.20 (0.49-2.93)	.68
			Confirmed Abuse	No Confirmed Abuse	Confirmed Abuse		
Cognitive function tertiles for MMSE							
Group 1 (score <20)	770	650 (84.4)	17 (2.2)	17.29	26.54	2.38 (1.23-4.62)	.01
Group 2 (score 20-25)	1741	1013 (58.2)	23 (1.3)	7.74	23.07	2.50 (1.47-4.25)	<.001
Group 3 (score 26-30)	6476	2417 (37.3)	20 (0.3)	4.49	10.01	1.47 (0.76-2.85)	.25
Physical function tertiles for chair stands							
Group 1 (0-1 times)	1616	1056 (65.3)	29 (1.8)	11.50	21.78	2.35 (1.45-3.81)	<.001
Group 2 (2-3 times)	3306	1515 (45.8)	21 (0.6)	5.58	15.81	2.51 (1.47-4.29)	<.001
Group 3 (4-5 times)	3819	1291 (33.8)	6 (0.2)	3.93	6.32	1.29 (0.32-5.19)	.72

Abbreviations: CI, confidence interval; HR, hazard ratio; MMSE, Mini-Mental State Examination.

^aThe reference categories for the stratified analyses are those participants in each of the cognitive function or physical function categories who did not have reported or confirmed elder self-neglect or elder abuse. The MMSE was excluded in the stratified analyses of cognitive function and the chair stand was excluded in the stratified analyses of physical function. Low levels of cognitive or physical function correspond to group 1 and high levels correspond to group 3.

^bAdjusted for age, sex, race, education (years completed), income, age × education, sex × education, medical conditions, MMSE score, chair stand, marital status, weight loss, alcohol use (>12 drinks in last 12 months), cigarette smoking (ever), Center for Epidemiologic Studies Depression score, and social network.

Table 6. Reported Elder Self-neglect and Cause-Specific Mortality

Type of Disease	Definition	Follow-up, Median (IQR), y	No Abuse Reported, Death per 100 Person-Years	Reported Self-neglect		Adjusted HR (95% CI) ^a	P Value
				Mortality Intervals, y	Deaths per 100 Person-Years		
Cardiovascular	All diseases of circulatory system	0.69 (0.29-1.75)	1.33	≤1	54.72	8.34 (6.72-10.34)	<.001
				>1	2.43	3.09 (2.28-4.22)	<.001
Pulmonary	All diseases of respiratory system	0.74 (0.43-1.70)	0.27	≤1	13.00	8.95 (5.71-14.03)	<.001
				>1	0.62	2.94 (1.51-5.75)	<.001
Neoplasm	All types of solid and nonsolid cancers	0.29 (0.07-0.96)	0.71	≤1	44.43	15.26 (11.73-19.84)	<.001
				>1	0.94	2.84 (1.78-4.54)	<.001
Endocrine	All endocrine, nutritional, and metabolic diseases	0.48 (0.17-0.85)	0.19	≤1	15.71	13.75 (8.65-21.85)	<.001
				>1	0.29	1.60 (0.58-4.46)	.18
Neuropsychiatric	All diseases of nervous system and mental and behavior disorders	1.16 (0.57-1.91)	0.18	≤1	4.88	8.00 (4.23-15.12)	<.001
				>1	0.45	4.02 (1.92-8.42)	<.001

Abbreviations: CI, confidence interval; HR, hazard ratio; IQR, interquartile range.

^aAdjusted for age, sex, race, cohort (refers to the original cohort or the successive cohort of the Chicago Health and Aging Project [CHAP]), education (years completed), income, age × education, sex × education, medical conditions, global cognition, Katz activities of daily living, Nagi impairment score, physical performance testing, marital status, weight loss, alcohol use (>12 drinks in last 12 months), cigarette smoking (ever), Center for Epidemiologic Studies Depression score, and social network.

Future studies of the encounters of self-neglectors with the health care system may elucidate this issue.

The mortality risk for confirmed cases of elder self-neglect was similar to those with reported self-neglect. The confirmed cases of elder self-neglect in this study included those with the mild cases of self-neglect, whereas social services agencies in other states may have only considered severe cases of self-neglect as confirmed self-neglect. However, we believe that our approach permits the capture of a broader spectrum of elder self-neglect and allows the examination of the adverse outcomes along the continuum of self-neglect severity.³⁷ Our results support this approach in showing that mortality risk increases with greater self-neglect severity. Improved understanding of this gradient of mortality risk could set the groundwork for future intervention studies to target the milder cases to prevent their progression toward greater severity and to forestall premature morbidity and mortality.

Elder Abuse and Mortality

The field of elder abuse is estimated to have lagged more than 20 years behind that of child abuse or intimate partner violence.⁴ Since the first report of “granny battering” in 1975 in the medical literature,³⁸ understanding of this pervasive public health and human rights issue remains limited. Our findings suggest a relationship between not only confirmed elder abuse and mortality risk, but also reported cases of suspected elder abuse and mortality risk. In addition, our findings indicate that the increased risk of mortality associated with elder abuse was not restricted to individuals with the most impaired levels of cognitive and physical function.

Elder abuse often involves complex interactions between the abused individual and the perpetrator. The conceptual model of sociocultural context suggested by the National Research Council⁴ focuses on the integration of individual-level factors of the abused individual and the perpetrator, their re-

lationship, socioeconomic status inequality, and power and exchange dynamic while considering the sociocultural context in which elder abuse takes place. The model highlights the importance of these interactions created by vulnerability and dependency of the abused person, especially due to cognitive and physical impairment. In our study, we considered a comprehensive series of characteristics of the elders but did not have information on the perpetrators.

The precise mechanism of the association between elder abuse and mortality remain unclear. In contrast to our results for elder self-neglect, we found that increased mortality risk was not associated with reported and confirmed elder abuse for those individuals with the highest levels of cognitive and physical function. The basis remains unclear. It is possible that individuals who experienced elder abuse also had the highest levels of cognitive and physical function, had more insights to the dangers of the abusive behaviors, were more likely to seek help, or had the ability to modify the relationship with the perpetrator. As a result, interventions may have been implemented to minimize future dangers to safety and well-being. In addition, the nature or extent of the elder abuse subtypes may be different among those with higher levels of cognitive and physical function, in which there is relatively lower mortality risk. This study had inadequate detail and power to fully examine this issue.

Study Limitations

Several limitations of this study should be considered. First, elder self-neglect and abuse are underreported, and the rate of underreporting is unclear from the current literature. If this misclassification is random, it may bias the observed relationship with mortality toward the null. Second, we did not have a uniform measure of elder self-neglect and abuse for the entire CHAP cohort, and hence were unable to elucidate the specific behaviors of elder self-neglect and subtypes of elder abuse

associated with mortality risk. However, this study provides a base for future study of elder self-neglect and abuse through uniform data collection in CHAP and in other cohorts. Third, we did not have information on the severity of medical conditions (ie, cardiovascular disease), detailed measures of the specific subtypes of cognition (ie, executive function), sensory disorders, illicit drug use, and psychiatric diagnosis, which could be potential confounders. Information on cognitive and physical function was collected more than a year on average before the elder self-neglect and abuse reports. Fourth, we did not have detailed information on the perpetrators or any available in-depth qualitative information about the interaction of the sociocultural context of the elder abuse. Fifth, the study did not have any information on the social services agencies' or health care professional's intervention as the result of the reported elder self-neglect and abuse or the extent of these interventions in modifying the mortality risk.

CONCLUSION

Elder self-neglect and abuse, common but underrecognized and poorly understood geriatric syndromes, are both associated with increased mortality, particularly among those with worse cognitive and physical function but present among all categories except the best functioning tertile in the case of elder abuse. The mortality risk of elder self-neglect was substantially higher in the first year of follow-up than in subsequent years. These results may be useful not only in informing future research efforts into elder self-neglect and abuse, but also to inform relevant clinical, social, and policy guidelines developed to treat and prevent elder self-neglect and abuse on a national level.

Author Contributions: Dr Dong had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Dong, Simon, Fulmer, Paveza, Evans.

Acquisition of data: Dong, Evans.

Analysis and interpretation of data: Dong, Simon, Mendes de Leon, Beck, Hebert, Dyer, Evans.

Drafting of the manuscript: Dong, Simon, Mendes de Leon, Beck, Paveza.

Critical revision of the manuscript for important intellectual content: Dong, Simon, Fulmer, Hebert, Dyer, Paveza, Evans.

Statistical analysis: Dong, Mendes de Leon, Beck, Hebert.

Obtained funding: Dong, Evans.

Administrative, technical, or material support: Dong, Dyer, Paveza, Evans.

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