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Prevalence of falls in a pooled US cohort of adults with systemic lupus erythematosus: a nested cross-sectional study.

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Title: Prevalence of Falls in a Pooled U.S. Cohort of Adults with Systemic Lupus Erythematosus

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Abstract

Objective: Epidemiologic data in the population with systemic lupus erythematosus (SLE) remain sparse. We estimated the prevalence and correlates of falls among adults with SLE and compared SLE prevalence estimates with those in the general U.S. population.

Methods: We assessed falls in the prior year cross-sectionally across two population-based SLE cohorts in California (3/2025–2/2026) and Georgia (10/2019–5/2022). Stratified prevalence was assessed with marginal estimates from logistic regression models with falls as the outcome. Age- and sex-standardized estimates in SLE were compared to 2023 U.S. population estimates (ages ≥45).

Results: In this pooled SLE cohort (*N*=780; mean age, 47.9; 91.9% women; 15.0% Asian, 52.6% Black, 4.9% Hispanic), 26.0% reported any fall in the prior year; among these, 59.1% reported falling twice or more, and 31.0% reported associated injuries. General factors [*e.g.*, older age (37.4% vs. 20.7% for ≥65 vs. 20-44), female sex (27.1% vs. 14.3%), and obesity (31.5% vs. 22.7%)] and SLE-related factors [*e.g.*, higher SLE activity (38.5% vs. 13.5%), moderate-to-severe depressive symptoms (40.0% vs. 23.7%), greater pain interference (43.8% vs. 16.5%), greater fatigue (39.2% vs. 18.8%), and lower cognitive function (39.7% vs. 18.9%)] were associated with higher fall prevalence in the SLE cohort. Among those aged ≥45, the age- and sex-standardized prevalence estimate in the SLE population (22.9%) was similar to the U.S. population estimate (19.5%).

Conclusion: The prevalence of falls in SLE is high and recurrence is common, suggesting clinical assessment of falls — especially in those with high disease activity and symptoms — is important in SLE.

Key Messages

What is already known on this topic

Recent estimates suggest that about one-third of adults with systemic lupus erythematosus (SLE) fall over the course of a year and that those with higher disease activity report a higher prevalence of falls.

What this study adds

This study pools data from two diverse adult SLE cohorts to provide more generalizable estimates of the prevalence of falls and compares these estimates with those in the similarly aged U.S. population.

How this study might affect research, practice, or policy

Given the high prevalence, recurrence, and SLE-specific correlates of falls that we observed in this study, clinical assessment of falls remains an important component of holistic SLE care, especially for patients with high disease activity, pain, fatigue, depression, or cognitive complaints.

Introduction

With both greater life expectancy due to advances in treatments for systemic lupus erythematosus (SLE)[1] and greater proportions of individuals newly diagnosed with SLE at older ages (15% diagnosed after age 60),[2] this population is aging. Furthermore, regardless of age, widespread chronic inflammation and related symptoms across multiple organ systems in the setting of SLE may contribute to accelerated aging among those with this disease.[3,4] These factors and associated frailty[5,6] may put those with SLE at increased risk of outcomes associated with older age, such as falls and associated injuries. However, data on falls in SLE remain sparse.[7]

Recently, we showed that nearly one-third of participants in a large, population-based U.S. adult SLE cohort [Georgians Organized Against Lupus (GOAL)] reported falling in the past year, and that disease activity and damage, but not age or sex, were associated with a higher prevalence of falls.[8] However, gaps remain in our knowledge of the epidemiology of falls in SLE, including whether these results generalize to a larger, more representative, and more diverse cohort and how the prevalence of falls in the SLE population compares to that in the similarly aged U.S. population. To address these gaps, we combined GOAL data with recently collected data from the California Lupus Epidemiology Study (CLUES) to estimate the prevalence and correlates of falls among adults with SLE and compare fall prevalence estimates in SLE to those in the general U.S. population.

Methods

Data Sources and Study Populations

Study population. CLUES and GOAL are ongoing, population-based cohorts that enroll adults (≥ 18 years) living in the San Francisco Bay Area and metropolitan Atlanta, respectively, with a documented diagnosis of SLE defined by American College of Rheumatology (ACR) criteria (9) [4 ACR criteria, or 3 ACR criteria with a diagnosis of SLE by an attending board-certified rheumatologist] or, in CLUES, by a diagnosis of lupus nephritis.[10] Study data were obtained via interviewer-administered questionnaire as part of the 10th annual CLUES survey (March 2025–February 2026) and via self-administered questionnaire in an ancillary study to GOAL [Approaches to Positive, Patient-centered Experiences of Aging with Lupus (APPEAL); October 2019–May 2022] (Supplementary Figure 1).[11] The University of California San Francisco Institutional Review Board approved the CLUES study (14-14429), and the Emory University Institutional Review Board approved the GOAL (IRB00003656) and APPEAL (IRB00110977) study protocols. All CLUES, GOAL, and APPEAL participants provided informed consent prior to participation.

U.S. population. We obtained the most recent available data on U.S. fall prevalence from the 2023 Behavioral Risk Factor Surveillance Survey (BRFSS; combined landline and cell phone survey data), available from the National Center for Health Statistics (NCHS) (Supplementary Figure 1).[12] Data on falls were collected only for adults aged 45 years or older in the BRFSS (Supplementary Figure 2). We used the 2020 American Community Survey 5-year estimate files,

available from the U.S. Census Bureau (Supplementary Figure 1),[13] to obtain U.S. population census data, stratified by age, sex, and race/ethnicity,

Variables

Falls. The number of falls in the prior year and the number of falls requiring medical attention in the prior year were collected in CLUES, GOAL, and BRFSS, with minor differences in the wording of questionnaire items across the data sources (Supplementary Table 1). "Any falls" was defined as ≥1 fall reported in the prior year; "two or more falls" was defined as ≥2 falls reported in the prior year; and "any injury fall" was defined as ≥1 fall that limited activities (BRFSS) or required medical attention (all data sources) in the prior year.

Other variables. Other variables of interest included demographics, SLE-related factors, and other clinical and psychosocial factors.

Demographics: Demographic variables of interest included age, sex (assigned at birth), race, and ethnicity. Race and ethnicity were self-reported at the time of falls by participants from a fixed set of categories and were combined and categorized as follows to align with the national data: Asian (non-Hispanic), Black (non-Hispanic), Hispanic (regardless of race), White (non-Hispanic), and other.

SLE-related factors: SLE duration was self-reported. For GOAL, duration was taken from the closest GOAL survey to the APPEAL assessment and adjusted for the time between

measurements (median: 2.7 months; Supplementary Figure 1). SLE activity was assessed at the time of falls data collection in both CLUES and GOAL, using the Systemic Lupus Activity Questionnaire (SLAQ; range 0-44; higher scores indicating greater SLE-related disease activity).[14] Cumulative SLE-related damage to individuals' systems was assessed by the Brief Index of Lupus Damage (BILD) score (range, 0-46; higher scores indicate greater cumulative SLE-related organ damage).[15,16] BILD was not measured simultaneously with falls in either cohort: for CLUES, the BILD score was collected between February 2024 and March 2025, and, for GOAL, the BILD score in the GOAL survey closest to the APPEAL visit was used (Supplementary Figure 1).

Other clinical and psychosocial variables: Clinical and psychosocial factors of interest included body mass index (BMI), physical activity, physical functioning, depressive symptoms, pain interference, fatigue, sleep disturbance, cognitive function, perceived stress, and opioid use. BMI was assessed by measured (APPEAL in-person visits) or self-reported (CLUES interviews and APPEAL remote visits) height and weight; BMI was categorized as obese ($\geq$30 kg/m^2) vs. not (<30 kg/m^2). In CLUES, physical activity was assessed with the item "Which of the following best describes your physical activity level?" with possible responses of: "seldom active, rarely active" (categorized as low), "somewhat active for at least 30 minutes, 3 or more times a week" (categorized as moderate/high), and "very active for at least 30 minutes, 3 or more times a week" (categorized as moderate/high). In GOAL, physical activity was measured with the International Physical Activity Questionnaire Short Form (IPAQ-SF) at the APPEAL visit, and activity level was collapsed as low and moderate/high, to match the CLUES categories.[17] Perceived physical function was assessed with PROMIS Physical Functioning-Short Forms (CLUES: version 10a;

GOAL, version 12a), with raw scores scaled to comparable T-scores (population mean=50, SD=10).[18,19] Depressive symptoms were assessed with the 8-item Patient Health Questionnaire (PHQ-8; score range, 0-12)[20] and the Patient-Reported Outcomes Measurement Information System (PROMIS) Depression Short Form 8[21] in CLUES and GOAL, respectively, with higher scores indicating a greater burden of depressive symptoms in both assessments. Cutoffs of ≥ 10[20] and ≥ 58.8[22] for the PHQ-8 score and PROMIS Depression Short Form 8b T-score were used to define moderate to severe vs. no or mild depressive symptoms. PROMIS Pain Interference, Fatigue, and Sleep Disturbance Short Forms were used in both CLUES (versions 4a) and GOAL (versions 8a) to measure pain interference (the extent to which pain affects engagement with social, cognitive, emotional, physical, and recreational activities), fatigue, and sleep disturbance, respectively; comparable T-scores were reported, with higher scores indicating higher pain interference, fatigue, and sleep disturbance. Similarly, perceived cognitive function was assessed with the PROMIS Cognitive Function Short Form in CLUES (version 6a) and GOAL (version 8a), with higher T-scores indicating higher perceived function. In GOAL, pain interference, fatigue, sleep disturbance, and cognitive function measures were taken from the closest GOAL survey to the APPEAL ancillary study (Supplementary Figure 1). The Perceived Stress Scale (PSS) score[23,24] (scale, 0-16; higher scores indicate higher perceived stress) was measured at the time of falls assessment in CLUES (4-item PSS; PSS-4) and GOAL (10-item PSS; PSS-10); the relevant PSS-10 items were used to calculate the PSS-4. Use of opioid medications was self-reported by participants, also at the time of falls assessment.

Patient and Public Involvement

Patients were involved in the design and conduct of this research. We used feedback from our pilot study of GOAL participants[25] to create our initial protocol; participant feedback was also used to modify the protocol as needed throughout the course of this study. Participant burden was carefully considered in the number and order of measures assessed in both APPEAL and CLUES; participants could skip assessments and take breaks as needed. Finally, GOAL and CLUES participants are informed of study results through regular study newsletters, which are suitable for a non-specialist audience.

Statistical Analysis

Descriptive statistics were used to describe the demographic, clinical, and psychosocial characteristics of the study population. The overall prevalence of any falls, two or more falls, and any injury falls was estimated overall and by age, sex, and race/ethnicity. Prevalence estimates of any falls stratified by SLE-related and other clinical and psychosocial characteristics were post-estimation marginal probabilities following multivariable logistic regression with any falls as the outcome and participant characteristics as the exposures, with adjustment for age and demographics (age, sex, and race/ethnicity). In sensitivity analyses, we estimated fall prevalence stratified by cohort, with assessment of potential effect modification using interaction terms. Finally, we obtained estimates of fall prevalence standardized to the age and sex distribution of the U.S. population (from the ACS 2020 5-year estimates). These estimates were then compared with the overall and age-, sex-, and race/ethnicity-stratified estimates of fall prevalence in the U.S. population, which we obtained from 2023 BRFSS, using appropriate survey weights and procedures per BRFSS guidelines.[12] In sensitivity analyses, we compared participant characteristics and falls between the cohorts using chi-square, *t*, and Wilcoxon rank-sum tests as

appropriate. In comparative analyses with the U.S. population, we also added race/ethnicity to the standardization of fall prevalence estimates. Complete case analysis was used. All analyses were performed with Stata v. 19.5 (StataCorp, College Station, TX).

Results

Characteristics of the Study Population

The mean (SD) age of the pooled SLE cohort (*N*=780) participants was 47.9 (13.5) years; 57.3% of participants were aged ≥45 years, and 12.7% were aged ≥65 years (Table 1). Most (91.9%) were women, while 15.0%, 52.6%, 4.9%, and 17.7% were Asian, Black, Hispanic, and White, respectively. At the time of falls measurement, participants had had SLE for a median of 18.3 years, and the median SLAQ score was 10.0. Over one-third (38.0%) of participants were obese, and 50.7% reported low physical activity. Mean physical and cognitive function T-scores were 44.0 and 48.5, while pain interference, fatigue, and sleep disturbance T-scores were 55.2, 55.4, and 53.2. Moderate or severe depressive symptoms were reported by 14.4%, and 11.3% reported current opioid medication use.

The cohorts had similar sex distributions (92.2% and 91.7% women in CLUES and GOAL, respectively), but, on average, CLUES participants were older than GOAL participants (mean age, 50.3 vs. 46.2 years; Supplementary Table 2). Race and ethnicity distributions also differed, with 33.0% and 30.0% of CLUES participants being Asian and White and 82.6% of GOAL participants being Black. CLUES vs. GOAL participants had longer median disease duration (24.0 vs. 15.0 years) but lower median SLAQ scores (7.0 vs 13.0); as well, they were less likely to be obese (25.9% vs. 47.2%) or have low physical activity (20.1% vs. 73.9%). CLUES participants had higher scores for physical function and lower scores for pain interference, fatigue, sleep disturbance, and stress, compared to GOAL participants, but cognitive function T-

scores and percentages of participants reporting moderate-to-severe depressive symptoms or opioid use were similar across cohorts (Supplementary Table 2).

Prevalence and Correlates of Falls

Overall, 26.0%, 15.0%, and 8.1% of the pooled SLE cohort participants reported at least one fall, two or more falls, and at least one injury fall, respectively, in the prior year (Table 2). Of those who fell, 120 (59.1%) reported falling twice or more, and 63 (31.0%) reported at least one injury with their fall(s). Reports of any falls were more common among those who were older (37.4% vs. 20.7% for those aged 65 vs. 20-44 years), female (27.1% vs. 14.3% for women vs. men), and Black (31.0%) or White (31.9%), compared to those who were Hispanic (19.4%) or Asian (8.0%). These patterns were similar for prevalence estimates for two or more falls and for injury falls (Table 2).

Even after adjustment for age, sex, and race/ethnicity, those with higher vs. lower disease activity (30.4% vs. 11.1%) and, to a lesser extent, cumulative disease damage (35.6% vs. 29.1%) had higher prevalence of any reported falls in the prior year (Table 3). While obesity and low vs. moderate-high physical activity were associated with higher prevalence of falls, these differences were somewhat attenuated with adjustment (21.0% vs. 17.3% and 23.8 vs. 16.3%, respectively). Moderate-to-severe depressive symptoms (30.0% vs. 16.9%) and higher perceived stress (24.7% vs. 14.7%) remained associated with higher prevalence of falls, even after adjustment, as did higher pain interference (35.1% vs. 13.8%), fatigue (29.4% vs. 14.0%), sleep disturbance (24.4% vs. 15.4%), and lower physical (34.2% vs. 13.4%) cognitive (32.7% vs. 14.6%) function T-scores. Opioid use was associated with more than 2-fold higher prevalence of falls even after

adjustment (40.9% vs. 17.2%). These patterns were similar when examined by cohort; however, among those with lower disease activity (10.7% vs. 17.9%), disease burden (12.1% vs. 27.0%), pain interference (12.0% vs. 21.3%), and fatigue (12.8% vs. 24.3%), CLUES participants reported a lower prevalence of falls compared to GOAL participants (Supplementary Table 3).

Comparison of Fall Prevalence in the SLE vs. the U.S. General Population

Among pooled SLE cohort participants aged 45 and older, 30.0% reporting falling in the prior year; the age and sex-standardized estimate was 22.9%, similar to the estimate in the U.S. population aged 45 years and older (19.5%; Figure 1 and Supplementary Table 4). Stratified, age- and sex-standardized estimates from the SLE population were generally similar to the U.S. population estimates; although estimates for the SLE vs. U.S. population were higher in the oldest age group (aged ≥65 years; 43.3% vs. 25.4%) and among Black (28.4% vs. 22.0%) and White (37.8% vs. 31.2%) subpopulations, the CIs of these estimates overlapped.

The age- and sex-standardized prevalence of two or more falls in the pooled SLE cohort (16.0%) was higher than the U.S. prevalence estimate (12.8%), but the CIs overlapped (Supplementary Table 5). Those who were aged ≥65 years (27.4% vs. 13.8%) or were White (32.1% vs. 19.2%) had higher prevalence of two or more falls than their U.S. general population counterparts. Overall, participants in the pooled SLE cohort reported fewer injury falls (age- and sex-standardized estimate, 6.1%) than the U.S. general population (10.0%); this pattern persisted across subgroups (Supplementary Table 6).

Among those in the pooled SLE cohort who were aged ≥45 years and who reported any falls, 40.6%, 26.2%, 14.9%, and 18.3% reported one, two, three, and four or more falls (Figure 2). These included 13.9%, 6.4%, 3.5%, and 7.4% reporting at least one injury among their falls (representing 34.2%, 24.4%, 23.5%, and 40.4% of those with one, two, three and four or more falls, respectively). In comparison, 47.2%, 24.2%, 11.4%, and 16.7% of those in the U.S. general population aged ≥45 years who reported any falls reported one, two, three, and four or more falls (Figure 2). These included 16.7%, 9.3%, 5.7%, and 9.8% reporting at least one injury among their falls (representing 35.4%, 38.4%, 50.0%, and 58.7% of those with one, two, three and four or more falls, respectively).

Discussion

In this pooled diverse SLE cohort, about one-quarter of the adult participants reported falling in the prior year. Of these, more than half reported falling multiple times, and nearly one-third reported associated injuries. Higher fall prevalence was associated with greater overall disease burden, increased psychological distress, reduced cognitive function, and older age and female sex in the pooled SLE cohort. Among SLE cohort participants aged 45 or older, about one-third reported falls, but the age- and sex-standardized prevalence estimate was only slightly higher than the U.S. population estimate.

Both this pooled-cohort study and our previous study in GOAL[8] estimated a higher fall prevalence than a previous small cross-sectional study in Turkey, in which 15% of women with SLE reported falls over the prior year.[26] This may reflect differences in falls measurement across the studies, or geographic or population differences in falls. To our knowledge, there are no other published estimates of fall prevalence among those with SLE, either in or outside of the United States.[7] However, the overall crude prevalence estimate (24%) in the pooled SLE cohort is similar to a pooled estimate for similarly aged patients with multiple sclerosis (28%),[27] and the crude estimate among those aged 45 or older (30%) in the pooled SLE cohort is similar to the pooled estimate from patients with another rheumatic disease, rheumatoid arthritis (34%).[28] Importantly, however, age- and sex-standardized estimates from the pooled SLE cohort did not differ substantially from those in the general U.S. population among those aged 45 or older. While this may reflect no true differences between the SLE and general populations in terms of falls, it may also reflect the availability of data only among the older population for comparison.

For example, relatively higher fall prevalence among the younger participants (aged 20-44) would be masked in our analysis. However, data from the Baltimore Longitudinal Study of Aging suggests a fall prevalence of 18% among younger U.S. adults, similar to the crude estimate among younger SLE participants (20%).[29]

Unlike our previous study involving only GOAL participants,[8] both older age and female sex were associated with a higher prevalence of falls in this pooled SLE cohort. This may simply be due to greater power to detect age and sex differences in fall prevalence in this larger cohort. Given the substantially different distribution of race/ethnicity between the cohorts, it may also reflect potential effect modification by race/ethnicity (*i.e.*, lesser effects of age and sex on fall risk in the Black subpopulation), which might explain the higher prevalence of falls in GOAL relative to CLUES among the subgroups with lower disease activity and burden. Regardless, the associations of older age and female sex with higher fall prevalence in the pooled SLE cohort mirror similar, well-known patterns in the U.S. general population and suggest that both older adults and women should be considered at higher risk for falls than their counterparts, regardless of their SLE status. Interestingly, despite obesity[30] and low physical activity[31] being strong risk factors for falls in the general population, we found that, after adjustment, differences in the pooled SLE cohort by these factors were attenuated.

However, we also found evidence that SLE-specific and SLE-related factors contribute to falls in this population. Higher SLE activity and greater pain interference were both associated with ~3-fold higher prevalence of falls, and greater fatigue was associated with ~2-fold higher fall prevalence. Lower vs. higher perceived cognitive function was associated with twice the reported

prevalence of falls, mirroring the general population, in whom shared cognitive and motor pathways are hypothesized.[32] Pain interference and, especially opioid use, were associated with higher prevalence of falls in the pooled SLE cohort; opioids have been consistently shown to increase fall risk in the general population.[33] There were also several strong psychosocial correlates of fall prevalence. Both moderate-to-severe vs. mild or no depressive symptoms and higher vs. lower perceived stress were associated with fall prevalence estimates that were nearly twice as high. Some of the effect of depressive symptoms may be due to antidepressant medication use, which is associated with an increased risk of falls in older adults.[34,35] In fact, in our previous analysis of GOAL data, we found that antidepressant use was associated with 82% higher prevalence of falls,[8] but these data were not collected in CLUES.

Several potential limitations of our study deserve mention. The 12-month recall period may have introduced misclassification of falls, particularly among those who had more memorable falls (*e.g.*, associated with a serious injury) or among those with cognitive dysfunction (who might be less likely to remember falls). There is also the possibility of residual confounding, including confounding by use of medications other than antidepressants that increase fall risk, such as antihypertensives and benzodiazepines. Different items measuring fall-related injuries in the pooled SLE cohort data (falls requiring healthcare visits or medical attention) vs. BRFSS (falls requiring medical attention or that limited your regular activities for at least a day) likely contributed to relatively lower estimates of injury fall prevalence, since it is likely that many individuals do not or cannot access healthcare during a short fall injury recovery period. Importantly, we did not collect data on the circumstances of the falls in both cohorts. Most falls are due to a combination of intrinsic or predisposing factors (*e.g.*, balance, strength, dizziness)

and extrinsic or precipitating factors (*e.g.*, slip or trip hazards, footwear, lighting). Understanding the contributions of these factors to patient-reported falls can provide clinicians with individualized fall prevention strategies. Finally, although the pooled SLE cohort was large, the results may not be generalizable outside of their respective catchment areas, and some subgroups, particularly those defined by multiple factors (*e.g.*, sex and race/ethnicity), remained too small for robust analysis.

In conclusion, we found that falls were common in this pooled SLE cohort. While our standardized estimates suggest that our prevalence was similar to that in the U.S. population, we found that factors associated with falls in those with SLE vs. the general population may differ, with greater SLE-related disease activity and symptoms with higher prevalence of falls. Given high prevalence and recurrence of falls, these SLE-specific correlates of falls, and potentially poor outcomes of falls, such as fractures or trauma, clinical assessment of falls remains an important component of holistic SLE care, especially for patients with high disease activity, pain, fatigue, depression, or cognitive complaints.

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Conflict of Interest

All authors declare no conflicts of interest related to this work.

Author Contributions

LCP – conceptualization, formal analysis, funding acquisition, data curation, project administration, supervision, writing – original draft. SSL - funding acquisition, resources, writing – revising & editing. CDT – project administration, resources, supervision, writing – revising & editing. CH – data curation, project administration, supervision, writing – revising & editing. PPK – methodology, writing – revising & editing. JY – methodology, writing – revising & editing. CBB - conceptualization, funding acquisition, methodology, writing – revising & editing.

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Table 1. Selected characteristics of pooled systemic lupus erythematosus cohort participants

Characteristic	Value
N	780
Sociodemographic	
Mean (SD) age in years	47.9 (13.5)
Age category, *n* (%)	
20-44	333 (42.7%)
45-54	202 (25.9%)
55-64	146 (18.7%)
≥ 65	99 (12.7%)
Sex at birth, *n* (%)	
Women	717 (91.9%)
Men	63 (8.1%)
Race/ethnicity, *n* (%)	
Asian	117 (15.0%)
Black	410 (52.6%)
Hispanic	38 (4.9%)
White	139 (17.7%)
Other	77 (9.9%)
Ethnicity, n (%)	
Hispanic	103 (13.2%)
Not Hispanic	675 (86.8%)
Clinical, physical, and psychosocial	
Median (IQR) disease duration, years	18.3 (10.5, 26.5)
Median (IQR) SLAQ score	10.0 (5.0, 16.0)
Median (IQR) BILD score	2.0 (1.0, 4.0)
Mean (SD) BMI, kg/m^2	28.6 (7.6)
Obese, *n* (%)	
Yes	292 (38.0%)
No	476 (62.0%)
Physical activity, *n* (%)	
Low	392 (50.7%)
Moderate/High	381 (49.3%)
Mean (SD) physical function T-score	44.0 (10.1)
Depression, *n* (%)	
Moderate or severe	110 (14.4%)
None or mild	653 (85.6%)
Median (IQR) perceived stress score	6 (3, 8)
Mean (SD) pain interference T-score	55.2 (10.3)
Mean (SD) fatigue T-score	55.4 (11.2)
Mean (SD) sleep disturbance T-score	53.9 (10.4)
Mean (SD) cognitive function T-score	48.5 (11.2)
Opioid pain medications, *n* (%)	
Yes	88 (11.3%)

Characteristic	Value
No	690 (88.7%)

BMI, body mass index; CLUES, California Lupus Epidemiology Study; GOAL, Georgians Organized Against Lupus; IQR, interquartile (25^{th}-75^{th} percentile) range; SLAQ, Systemic Lupus Activity Questionnaire (range, 0-44; 44 is maximum activity).
Missing values: ethnicity (GOAL, *n*=1; CLUES, *n*=1), BILD score (CLUES, *n*=333), SLE duration (GOAL, *n*=1) BMI/obesity (GOAL, *n*=11; CLUES, *n*=1), physical activity (GOAL, *n*=7), depressive symptoms score (GOAL, *n*=17), pain interference (GOAL, *n*=7), cognitive function (GOAL, *n*=309), fatigue (GOAL, *n*=1), perceived stress score (GOAL, *n*=2), and opioid pain medications (CLUES, *n*=2).

Table 2. Prevalence of falls in the total pooled cohort overall and by age, sex, and race/ethnicity

	Any fall in prior year		Two or more falls in prior year		Any fall with injury in prior year	
Demographic	***n/N***	**% (95% CI)**	***n/N***	**% (95% CI)**	***n/N***	**% (95% CI)**
Overall	203/780	26.0 (23.0-29.3)	120/780	15.4 (12.9-18.1)	63/780	8.1 (6.3-10.2)
Age						
20-44	69/333	20.7 (16.5-25.5)	38/333	11.4 (8.2-15.3)	15/333	4.5 (2.5-7.3)
45-54	54/202	26.7 (20.8-33.4)	37/202	18.3 (13.2-24.4)	18/202	8.9 (5.4-13.7)
55-64	43/146	29.5 (22.2-37.6)	23/146	15.8 (10.3-22.7)	16/146	11.0 (6.4-17.2)
≥65	37/99	37.4 (27.9-47.7)	22/99	22.2 (14.5-31.7)	14/99	14.1 (8.0-22.6)
Sex						
Women	194/717	27.1 (23.8-30.5)	115/717	16.0 (13.4-18.9)	61/717	8.5 (6.6-10.8)
Men	9/63	14.3 (6.8-25.4)	5/63	7.9 (2.6-17.6)	2/63	3.2 (0.4-11.0)
Race/ethnicity						
Asian	9/113	8.0 (3.7-14.6)	6/113	5.3 (2.0-11.2)	1/113	0.9 (0.02-4.8)
Black	125/403	31.0 (26.5-35.8)	77/403	19.1 (15.4-23.3)	35/403	8.7 (6.1-11.9)
Hispanic	20/103	19.4 (12.3-28.4)	9/103	8.7 (4.1-15.9)	5/103	4.9 (1.6-11.0)
White	33/138	31.9 (24.2-40.4)	27/138	19.6 (13.3-27.2)	20/138	14.5 (9.1-21.5)

Table 3. Prevalence of any falls reported in the past year in the pooled cohort, by clinical and psychosocial characteristics

	Percentage falling in prior year (95% CI)		
Characteristic	**Unadjusted**	**Age-adjusted**	**Age-, sex-, and race/ethnicity-adjusted**
Disease duration			
<10 years	24.1 (18.4, 31.0)	27.9 (21.1, 35.8)	19.9 (13.7, 28.2)
≥10 years	26.6 (23.2, 30.3)	25.1 (21.7, 28.9)	18.8 (14.5, 23.9)
Disease activity			
<median (=9)	13.5 (10.5, 17.4)	13.4 (10.3, 17.1)	11.1 (7.9, 15.4)
≥median[b]	38.5 (33.7, 43.4)	38.0 (33.3, 42.9)	30.4 (23.6, 38.2)
Disease damage			
<median (=2)	27.2 (21.8, 33.4)	27.5 (21.9, 33.7)	29.1 (17.8, 43.7)
≥median[b]	34.1 (28.2, 40.5)	33.7 (27.7, 40.2)	35.6 (22.5, 51.3)
Obesity			
No	22.7 (19.1, 26.7)	22.4 (18.8, 26.4)	17.3 (13.1, 22.5)
Yes	31.5 (26.4, 37.1)	31.0 (26.0, 36.6)	21.0 (15.4, 28.0)
Physical function			
High-average (T-score >40)	15.4 (12.4, 18.9)	15.6 (12.5, 19.2)	13.4 (9.9, 17.8)
Low (T-score ≤40)	42.0 (36.6, 47.5)	41.0 (35.6, 46.7)	34.2 (26.3, 43.1)
Physical activity			
Low	31.9 (27.5, 36.7)	32.0 (27.5, 36.8)	23.8 (17.8, 31.2)
Moderate-High	20.5 (16.7, 24.8)	19.7 (16.0, 24.0)	16.3 (12.2, 21.6)
Depression			
Moderate or severe	40.0 (31.3, 49.4)	39.7 (30.9, 49.2)	30.0 (21.2, 40.4)
None or mild	23.7 (20.6, 27.2)	23.4 (20.2, 26.8)	16.9 (12.9, 21.8)
Perceived stress			
<median (=5)	19.3 (15.7, 23.5)	18.4 (14.8, 22.6)	14.2 (10.3, 19.1)
≥median[b]	32.6 (28.2, 37.5)	32.9 (28.4, 37.8)	24.7 (19.0, 31.5)
Pain interference			
High (T-score ≥60)	43.8 (38.1, 49.8)	43.2 (37.5, 49.2)	35.1 (27.1, 44.0)
Low-average (T-score <60)	16.5 (13.5, 20.0)	16.4 (13.4, 19.9)	13.8 (10.3, 18.3)
Fatigue			
High (T-score ≥60)	39.2 (33.6, 45.1)	38.8 (33.2, 44.8)	29.4 (22.5, 37.3)
Low-average (T-score <60)	18.8 (15.6, 22.4)	18.4 (15.3, 22.1)	14.0 (10.3, 18.5)
Sleep disturbance			
High (T-score ≥60)	35.0 (28.0, 42.7)	34.7 (27.7, 42.5)	24.4 (17.2, 33.5)
Low-average (T-score <60)	21.1 (17.6, 25.0)	20.5 (17.1, 24.4)	15.4 (11.3, 20.7)
Cognitive function			

Characteristic	Percentage falling in prior year (95% CI)		
	Unadjusted	Age-adjusted	Age-, sex-, and race/ethnicity-adjusted
High-average (T-score >40)	18.9 (15.1, 23.3)	18.3 (14.6, 22.8)	14.6 (10.4, 19.9)
Low (T-score ≤40)	39.7 (31.2, 48.8)	38.7 (30.2, 48.0)	32.7 (23.3, 43.6)
Opioid medication use			
Yes	52.2 (41.9, 62.5)	50.7 (40.2, 61.0)	40.9 (29.3, 53.6)
No	22.8 (19.8, 26.0)	22.6 (19.6, 25.9)	17.2 (13.3, 22.0)

Figure 1. Crude and age- and sex-standardized prevalence of any falls in the prior year among adults aged 45 and older in our pooled cohort with systemic lupus erythematosus vs. in the U.S. population. *U.S. population estimates were obtained using the 2023 Behavioral Risk Factors Surveillance Survey data.*

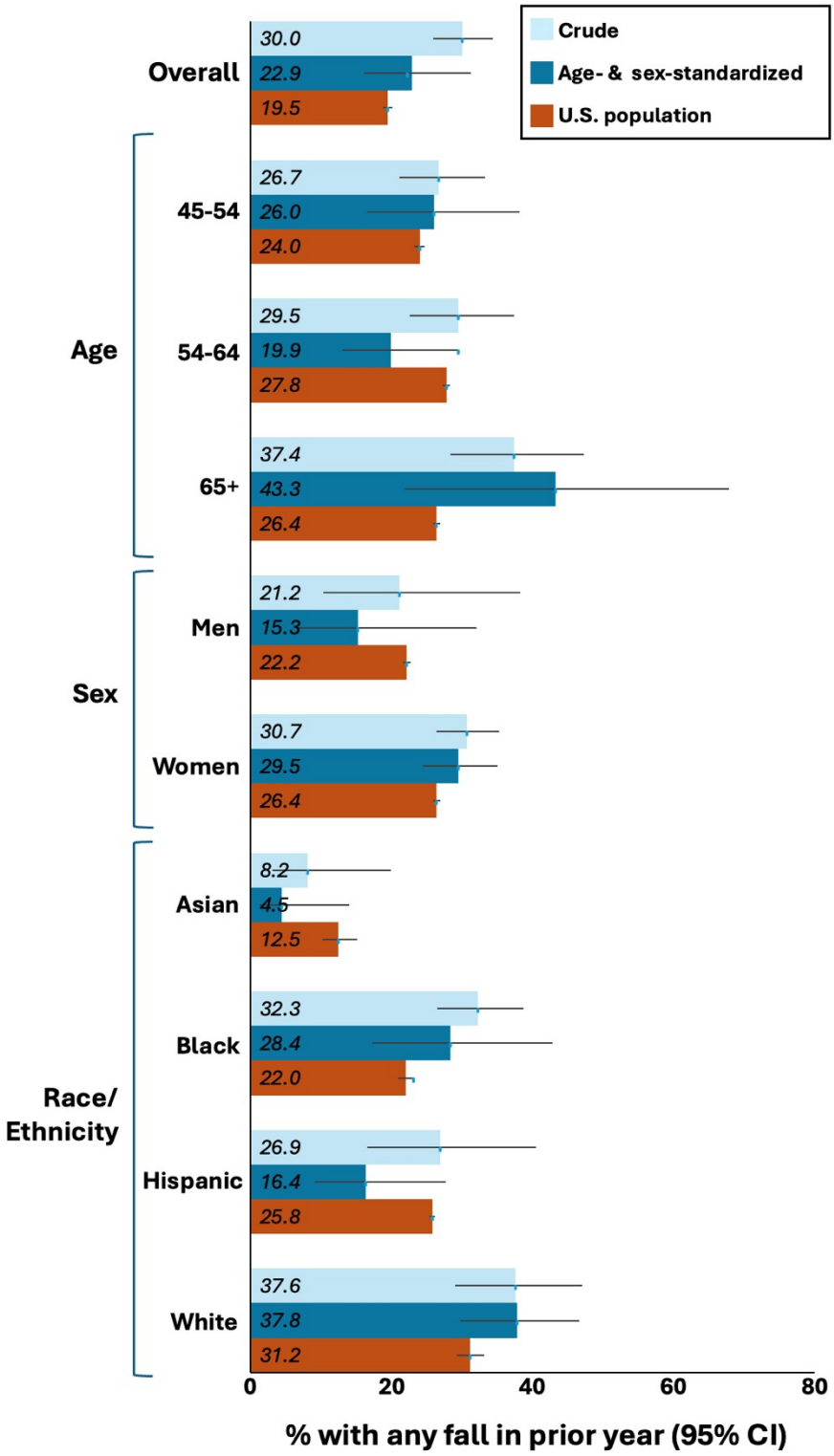
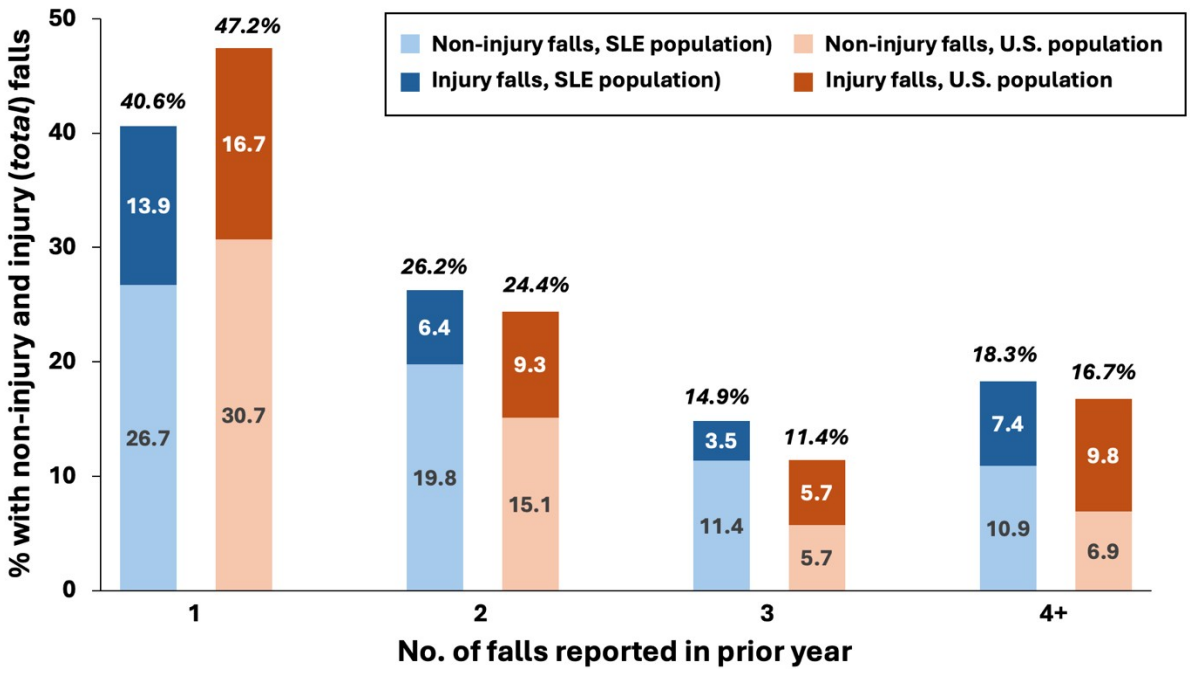


Figure 2. Distribution of number of falls and related injury in the pooled SLE cohort vs. the U.S. population, among those who reported falling in the prior year. *U.S. population estimates were obtained using the 2023 Behavioral Risk Factors Surveillance Survey data.*


Non-injury falls, SLE population)
Non-injury falls, U.S. population
Injury falls, SLE population)
Injury falls, U.S. population
% with non-injury and injury (total) falls
No. of falls reported in prior year
40.6%
47.2%
26.2%
24.4%
14.9%
11.4%
18.3%
16.7%
26.7
13.9
30.7
16.7
19.8
6.4
15.1
9.3
11.4
3.5
5.7
5.7
10.9
7.4
6.9
9.8
0
10
20
30
40
50
1
2
3
4+