

## Critical Analysis of Fall Risk Factors and Socioeconomic Status (SES) Among Elderly People in Community Settings

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**Extended Abstract:** Community-dwelling older adults have a high prevalence of falls (or risks of falls) posing substantial threat to physical, cognitive & mental health, and wellbeing. Falls among community-dwelling older adults is a substantial public health and safety challenge. Understanding the risk factors for falls of older adults (Pluijijm et al., 2006; Bongue et al., 2011), and how to effectively prevent falls in community-dwelling older adults are significant and important extents for various stakeholders (e.g., systems engineers, safety & health professionals, researchers/clinicians, policy makers, and caretakers) (Rubenstein, 2006; Rodrigues et al., 2014; Choi & Lee, 2016). The roles of individual and environmental risk factors of falling (or risks of falls) have been recognized (Lord et al., 2007; Ambrose et al. 2013).

Aging is a widely known fall risk factor as it induces declines in physical and physiological function, causing diminished strength, postural imbalance, and various chronic diseases (Ambrose et al., 2013; Singh et al., 2015; Chang & Do, 2015). Cognitive impairment is also another main fall risk factor in older adults as cognitive impairment can delay sensory integration and the selection/execution of proper corrective responses to prevent falls, especially in critical situations such as slips, trips and missteps (Lew & Qu, 2014; Qiu & Xiong, 2017; Segev-Jacobovski et al., 2011). Environmental/physical hazards represent another perilous category of risk factor to community-dwelling older adults since they can slip/trip easily due to unexpected barriers and inappropriate walking swing or functionality decline that can inhibit the ability to navigate unfamiliar surroundings (Chang et al., 2016).

The objective of this critical analysis was to review and synthesize the available research reported on fall risk factors associated with socioeconomic status (SES) among community-dwelling older adults. A structured literature review was performed using APA PsycInfo, Google Scholar, Medline, ProQuest, PubMed, and Web of Science, and the years reviewed for this critical review were 2001-2022. Eighty-nine relevant articles were assessed for eligibility, and 23 articles were included and analyzed in this critical review. Individual and socioeconomic factors contributing to older adults falling or risk of falls were sociodemographic, education, income, literacy, marital status, employment, medication, physical/cognitive functions, and frailty phenotype. Females with limited literacy, low-moderate family income, depression symptoms, lower/upper extremity functional limitation, and balance limitation had a higher prevalence of falls.

A general keyword search was used to identify relevant studies from major electronic databases/search engines: APA PsycInfo, Google Scholar, Medline, ProQuest, PubMed, and Web of Science. In this study, the keywords used included ‘ageing

or aging or aged or old or older or elderly', 'older adults' 'fall or falling', 'balance', 'physical capacity', 'strength', 'social function', 'socioeconomic', 'socioeconomic status', 'educational level', 'income', 'wealth', 'marital status', 'employment', 'occupation', 'community', 'community-based', 'community-dwelling', 'neighborhood', 'built environment', 'physical environment', 'risk', 'risk factor', 'intervention', and their combinations. Selection criteria for papers included publication within the last twenty years (January 2001 to April, 2022), English text, relevant to the research topic, and full-text availability. The identified articles were initially screened for their topic relevance and article duplications. Only peer-reviewed journal articles meeting inclusion criteria were screened for study relevance. Also, the preferred reporting items for systematic reviews and meta-analyses checklist & flowchart were used to evaluate methodological quality (PRISMA, 2021).

Twenty-three studies that were reviewed in regards to falls (risk factors for falls) associated with SES among community-dwelling older adults. The most common study design employed was cross-sectional analysis, followed by prospective cohort study, longitudinal survey, and population or secondary analysis. Individual level factors as contributors to the risks of falls in older adults were advanced age, gender, race/ethnicity, being less educated, having lower income, being not married or being widowed, living alone, being unemployed, lacking health insurance/Medicare coverage, vitamin D deficiency, limitations in activities of daily living (ADLs), fear of falling (FOF), lower relationship satisfaction, and lack of social support (Kim et al., 2020; Nicklett, 2017; Akosile, et al., 2020; Drummond et al., 2020; Aspell et al., 2019; Chen et al., 2018; Kamińska et al., 2015). Environmental or community-level factors related to older adult falls were living in low SES public housing, rural residence, home needing repair, poor home living environment, neighborhoods with low levels of social capital, living in a mobile home or home with uneven flooring, and a lack of tap water and elevators in high rise buildings (Canever et al., 2021; Pirrie et al., 2020; Zhang et al., 2019; Hu et al., 2015; Hayashi et al., 2014; Janakiraman et al., 2019; Pengpid & Peltzer, 2018). Factors that were more likely to be associated with higher risk of falling and SES were being female, having advanced age (older than 85 years), lower educational attainment, living alone (not married or widowed), and having a greater fear of falling (Kim et al., 2020; Aspell et al., 2019). FOF was more common among females, and those who had a history of falls, poor balance and gait status, poor perceived health, depression, and those who used assistive mobility devices or had greater ADL dependency (Drummond et al., 2020; Canever et al., 2021; Hoang et al., 2016).

Age is the only characteristic that is consistently associated with the location of the cut-points for reporting mobility difficulty (Cornman et al., 2011). Aging is a widely known falls risk factor as it induces declines in physical and physiological function, causing diminished strength, postural imbalance, and various chronic diseases (Ambrose et al., 2013; Singh et al., 2015; Chang & Do, 2015). Another risk factor for falls in aging populations is cognitive impairment (Holtzer et al., 2007; Tinetti et al., 1988). Older adults with dementia have a higher risk of falls (200%-300%) than those of cognitively healthy older adults (Allali et al., 2017; Eriksson et al., 2009). Moreover, poor cognitive functioning has been found to be a risk factor for falls in older women (Pengpid & Peltzer, 2018). Sleep problems and depression among older adults have also been shown to increase risk of falls (Gale et al., 2016; Brassington, et al., 2000). For instance, sleep disturbance/impairment among older men and depression symptoms among older women were strongly associated with single and multiple falls (Gale et al., 2016). Advanced age, lower educational level, being single or widowed, having poor health status, and poor balance ability/physical inactivity increased risk of falls among older community-dwelling older adults (Zhang et al., 2019; Hu et al., 2015). Physical inactivity can intensify the risk of developing a disability, which affects mobility and the ability to perform even the most basic ADLs, and ultimately increases the risk of falls in older adults (Lu et al., 2020). Also, BMI was identified as a significant risk factor for hip fractures among community-dwelling older adults (Wilson et al., 2006).

A technology-assisted solution (e.g., ActivLife device) can promote physical exercise and provide mental stimulation for older adults to provide adequate support for cognitive processes and prevent falls (Lu et al., 2020). Risk of falls was approximately  $\geq 20\%$  lower in older people who participated in organized sports at least once a week through the improvements of physical strength and balance (Hayashi et al., 2014). Group-based exercise programs offered by local-community organizations in natural settings can successfully increase balancing ability among community-dwelling older adults concerned about falls (Robitaille et al., 2005). Physical activity programs tailored to less-educated individuals with poor mental and physical health might be necessary to optimize adherence within the most at-risk segments of community-based older adults (Shah et al., 2015).

All in all, individual, community & physical environmental factors can contribute to the falls and risk factors of falling among community-dwelling older adults. Individual and socio-economic factors contributing to older adults falling or risk of falls included sociodemographic characteristics (e.g., age, gender, race/ethnicity), educational level, income level, health literacy, marital status, living alone/relationship, employment, medication, ADLs, FOF, physical activities, and cognitive function. Additionally, lower SES accelerates aging accompanied by the decline in an individual's functional abilities and frailty phenotypes, increasing risk of falls and long-term health problems. A further endeavor is warranted to perform an empirical or explorative study to examine falls prevention intervention strategies & recommendations, which would take into consideration of the relationships between socioeconomic factors and falls (risks of falls) among community-dwelling older adults.

*NOTE: This extended abstract is a part/modified version of an article to be published: Choi, S. D., & Andrade, E. L. (In press). Multiple-Level Fall Risks Associated with Socioeconomic Factors Among Community-Dwelling Older Adults: A Systematic Review. Special Issue of Industrial and Systems Engineering Review.*

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