

A DESCRIPTIVE AND VISUAL ANALYSIS OF THE NORTH COAST FALL
PREVENTION SURVEY DATA

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ABSTRACT

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Older adults over 65 will double from 52.4 million in 2018 to 94.7 million in 2060. Among this aging group, falls affect one out of four older adults and are a critical economic concern for our American society, with yearly costs of \$50 billion. In older adults, falling can result in negative consequences such as fear of falling, injuries, mobility restrictions, and loss of independence. California has one of the highest costs per fall (\$4 billion annually) and a high percentage of adults who have fallen (30.6%) compared to the nation. Moreover, two of California's northwest rural counties, Del Norte, and Humboldt County, have higher rates of falls than the rest of the state. Thus, the purpose of this study was to (1) identify fall risk and prevention needs by distributing the *North Coast Fall Prevention Survey (NCFP)* to adults aged 60 years and over in Humboldt and Del Norte Counties, and (2) to visually depict layers of this data across Humboldt and Del Norte zip codes. Participants completed the survey either by paper or online. Data were analyzed using descriptive statistics and Geographic Information Systems (GIS). The descriptive analysis showed Humboldt and Del Norte Counties had a variety of intrinsic, extrinsic, and behavioral risk factors consistent with previous literature. The maps of Humboldt and Del Norte Counties revealed areas needing fall

prevention. The results of this study warrant further data collection and analysis; however, they will assist the North Coast Fall Prevention Coalition and local agencies with strategic planning.

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INTRODUCTION/LITERATURE REVIEW

Aging Population

Americans are getting older. By 2060, older adults will compose 25% of the nation (Centers for Disease Control and Prevention, 2022). One of the primary reasons the number of older Americans is increasing is that the baby boomer generation, born between 1946 and 1964, are all expected to be over 65 by 2030. This growth will increase the older population from 56 million in 2020 to 74 million in 2030 (Colby & Ortman, 2015).

This newer older generation will be more racially and ethnically diverse, have lower marriage rates, fewer kids, higher education, and live longer (Pruchno, 2012). They will also find themselves fulfilling a caretaker role while simultaneously receiving care. Already, addressing the needs of this older and diverse population has become a challenge. Unmarried men and widowed women have worse socioeconomic outcomes than previous older adults. Women are outliving men but experiencing decreased functioning (Crimmins et al., 1996), and aging is correlated with increased healthcare and pharmaceutical costs across private and public insurance (Sharma, 2018). As our older population continues to grow, preventative care is needed to alleviate the rising costs to our nation, increase the quality of life of older adults, and decrease the healthcare demands of our aging Americans.

Falls

One growing concern in this aging population are falls. Falls are a national public health concern in the older population because they are expensive, common, can lead to a decrease in quality of life, and are preventable. A fall is defined as an unintentional or sudden loss of balance resulting in a lower ground level (Kellogg International Work Group, 1987). According to the Centers for Disease Control and Prevention, one in four adults will fall each year (Centers for Disease Control and Prevention, 2019). Commonly reported injuries found in literature were hip and wrist fractures, traumatic brain injuries, sprains, lacerations, and hematomas (Terroso et al., 2014; Berg et al., 1992). Older adults who suffer hip fractures are three times at increased risk of mortality during the first 3-6 months of injury (Katsoulis et al., 2017). Additionally, about 5% and 10% of falls will result in fractures and soft tissue injuries respectively (Tinetti & Speechley, 1989). As the aging population gets older, the rate of an injurious fall has been shown to increase in both male and female populations (Sattin et al., 1990). Recurrent fallers, (fallers who experience more than one fall) are more likely to result in serious injuries such as fractures, abrasions, and lacerations (Gaebler, 1993). They are also more likely to get transferred to a nursing home after hospitalization.

In 2015, falls in community dwelling, non-institutionalized older adults cost the nation \$50 billion (Florence et al., 2018). Most of the financial burden was shared by Medicare (\$28.9 billion), followed by Medicaid (\$8.7 billion) and private or other insurances (\$12.4 billion).

To prevent the consequences of falling, it is imperative medical professionals are aware of fall risk factors that may place an individual at risk of falling. “A risk factor is defined as a characteristic or situation found significantly more often among individuals who subsequently experience a certain adverse event than individuals not experiencing an event” (Rubenstein & Josephson, 2002). Due to the large amount of risk factors identified as contributing to falls, they have been organized into three categories: intrinsic, behavioral, and extrinsic risk factors (Terroso et al., 2014)

Fall Risk Factors

Intrinsic risk factors

Intrinsic fall risk factors are personal and medical characteristics.

Sociodemographic risk factors are unmodifiable yet can be used to identify at risk populations. By contrast, medical characteristics are sometimes modifiable and affect an individual’s postural stability.

Sociodemographic risk factors.

Sociodemographic factors such as age, gender, race, ethnicity, income, education, marital status, and veteran status are unmodifiable risk factors but important to be aware of for fall prevention efforts. As adults get older, the risk of falling increases (Bergen et al., 2019; Deandrea et al., 2010). Aging is a risk factor for falls because of the increased prevalence of other risk factors such as a fall history, fear of falling, chronic diseases, deficits with central processing and decreases in walking speed, medication usage, decline in the sensory perception, functional decline, decreases in strength and flexibility,

and postural stability (B. Moreland et al., 2020; Sekaran et al., 2013; Rubenstein & Josephson, 2006; Arcury et al., 2005; Rubenstein & Josephson, 2002; Tinetti & Williams, 1998; Alexander, 1996; Tinetti & Speechley, 1989; Horak et al., 1989). About 25-30% of adults aged 65 years and over fall each year and this percentage increases to 40% in adults aged 75 years and over (Centers for Disease Control and Prevention, 2021b; Tinetti & Williams, 1998). Adults 60 years and over are more likely to die from an injurious fall than any other age group (World Health Organization, 2021). Additionally, adults aged 80 years and over are two times more likely to fall (Rubenstein & Josephson, 2006, 2002) and adults 85 years and over are four times more likely to report fear of falling (Bertera & Bertera, 2008). Other sociodemographic factors such as gender, race and ethnicity, Veteran status, lower income, marital status, and education have also been associated with increased risk of falls.

Women are more likely to fall and have a 40-60% higher injury rate than men (Stevens & Sogolow, 2005). Women are also twice as likely to fracture their hips because of a fall. Women who had fractured their hips showed 11 to 15% lower bone mineral density at the trochanteric, intertrochanteric, femoral neck and total hip (Greenspan et al., 1994). Women are also twice as likely to be hospitalized from a fall. Additionally, women who are considered frail and have urinary incontinence are more likely to have a fall history. While women may fall more often, men are two times more likely to die from a fall (El-Menyar et al., 2019). Additionally, men who have reported a fall history are more likely to have higher levels of depressive symptoms and difficulty performing balance assessments (Gale et al., 2016).

Gender differences also exist between indoor and outdoor falls (Duckham et al., 2013). Women are more likely to have an indoor injurious fall while walking, performing light household tasks, and moving from sitting to standing at their own home, another home, or some other building. Women are also more likely to report falling in the kitchen on dry surfaces as well as slipping and tripping compared to men. In contrast, men are more likely to fall outdoors around their homes, forests, parks, and golf courses while performing vigorous activities such as hiking, tennis, jogging, or while doing household activities such as home repairs, lawn work, outdoor gardening, and taking care of others (Duckham et al., 2013; Chan et al., 2006). They are also more likely to fall on surfaces such as snow or ice as compared to women (Duckham et al., 2013).

Although limited, there is some evidence that the incidence of falls may vary by race and ethnicity. For example, in a study examining differences in fall rates and circumstances in community dwelling Caucasian and African American women, African American women were more likely to fall forwards and, on their hands, and wrists compared to Caucasian women who fell laterally (Faulkner et al., 2005). Moreover, Chinese were found to fall more often outside, and in the daytime in rural settings (Kwan et al., 2011). On the other hand, African American women were found to fall more inside (Faulkner et al., 2005), and in general African American fall rate is lower than Caucasians and Latinos (Hanlon et al., 2002). The lower fall incidence for African Americans was suggested because of less mobility due to increase balance issues and muscular deficits found in this population and higher mortality rates which would lead to less external fall exposure (Nicklett & Taylor, 2014). Fall rates for Latinos were found to

be like Caucasians although their circumstance differed (Hanlin et al., 2013).

Additionally, indigenous native American rural older adults in California were found to fall more frequently than non-indigenous adults, but their risk factors differed when compared to non-indigenous adults (Bouweraerts & Ortega, 2019).

More than half of the United States' Veteran population (18 million total Veterans) are older than 65 years. Additionally, the median age of Veterans today is 65 years. Older adult Veterans served in periods from World War II, Korean and Vietnam Era and in 2015, 87% of Veterans aged 65 and over were male. In 2018, about one in three Veterans had served in the Vietnam Era (Vespa, 2020).

Older adult Veterans report poorer health (31% compared to 26% of Americans) and are more functionally disabled (Popham et al., 2019). About 67% of older adults have three or more chronic diseases and 22% have symptoms of depression. Vietnam era Veterans also have a higher prevalence of posttraumatic stress disorder (30%) compared to the rest of the population (8%) (Wilmoth & London, 2011). An analysis of older Veterans with a fall history found 75% had been prescribed at least one fall risk increasing drug, and of this population, 75% had been prescribed two or more fall risk increasing drugs (Elias et al., 2020). Despite Veterans having a higher prevalence of fall risk factors, there is limited research in fall risk comparison with the rest of the nation's population. One recent research found older adult Veterans fall more often than Americans but experience less fall related injuries (Marciniak et al., 2020). This study also observed older adult Veterans reported more physical activity than the rest of the population.

A higher prevalence of falls in older adults with incomes less than \$25,000 has been observed (United Health Foundation, 2021). About one in three older adults live below poverty level and women are more likely than men to be poor (Cubanski et al., 2018). Women who have higher incomes have decreased risk of falls (Chang & Do, 2015).

Marriage has been associated with decreased fall risk (Çakar et al., 2011). Conversely, being widowed and divorced is independently associated with higher risk of falls in men (Chang & Do, 2015). In the 2016 US Behavioral Risk Factor Surveillance System (BRFSS), a higher prevalence of falls was reported by 34.6% of unmarried couples, 33.2% of widowed, 32.7% divorced, and 31.3% of older adults who had never been married (Bergen et al., 2021).

In 2016, a national study found older adults with an education less than high school had a higher percentage (12.2%) of fall injuries than those with higher education. (Bergen et al., 2021). In China, adults aged 60 and over with education less than high school had 49.24% of nonfatal falls and 72.66% of fall related deaths (Li et al., 2013).

Medical characteristics.

Postural stability, defined as the ability to maintain balance when postural disturbances occur, is essential for an individual to move and stand without falling (Melzer et al., 2004). Postural stability relies on the interaction of physiological systems such as the visual, somatosensory, and vestibular sensory systems, as well as neuromuscular and skeletal systems (e.g., motor control, strength, and flexibility). Maki and McIlroy (1996) describe our body as a multilink inverted pendulum where our center

of mass is at the top of the base of the support. This connection is constantly held together by our body controlling the COM with torques at the joint, the BOS moving to maintain the COM upright, and the ability of our sensory systems to provide feedback and feedforward information. Postural control is defined as the “process by which the central nervous system generates the patterns of muscle activity required to regulate the relationship between the COM and BOS. Falls happen when a postural disturbance occurs and there is a failure of the postural systems to maintain postural control. Intrinsic risk factors that affect these systems and place an individual at an increased risk of falling include history of falls, fear of falling, chronic conditions, cognitive deficits, medications, sensory deficits, and functional limitations.

A history of two or more falls is a risk factor for future falls (Cwikel et al., 1998). A history of falls is among the top questions asked in fall risk surveys because it often reveals other risk factors and is a marker for underlying health conditions and frailty. A frail older adult is defined as an individual who has decreased physiological capacities resulting in increased vulnerability to stressors (Walston et al., 2006) and is consequently at greater risk of falls and more likely to experience recurrent falls (Cheng & Chang, 2017). Moreover, a history of injurious falls is an independent predictor of decreased functional capacities (Tinetti & Williams, 1998). In a three-year study of 1,103 community dwelling adults over 71 years, adults who had 1-3 injurious falls had decreased (ADL) and instrumental activities of daily living (IADL). Additionally, one injurious fall was associated with decreased physical activities while two falls showed decreased social activities (Tinetti & Williams, 1998).

When assessing fall history, the fall event is often analyzed to understand causes and consequences of falls (Carter et al., 2001; Berg et al., 1992). A fall event can be broken down into three phases: initiation, fall descent, and fall impact (Carter et al., 2001; Berg et al., 1992). The fall event can identify fall risk factors and serve as a method of preventing future falls if risk factors are addressed. Information collected to understand a fall event includes location and time of fall, type of activity performed prior to falls, possible causes of falls, direction of the fall and any injuries resulting from the fall. The direction in which a person falls is useful in determining the type of injury that may occur. For example, hip fractures often result from falling to the side while wrist injuries often occur when a person falls forward or backwards (Nevitt & Cummings, 1993). Falls from heights of 17+ cm places an individual at greater risk of having hip fractures when falling to the side (Hayes et al., 1993). Researchers speculate that the incidence of hip fractures is reduced when older adults attempt to lessen the impact of falling to the side by stretching out their arms, or by having more body tissue to absorb the force (Greenspan et al., 1994; Hayes et al., 1993). Additionally, research found older adults who had high bone mineral density around the femoral neck were less likely to have an injurious fall during high displacement fall (> 17 inches) (Greenspan et al., 1994).

Fear of Falling (FOF) and fall incidence in older adults are interrelated and risk factors for each other (Friedman et al., 2002). To determine if FOF occurred before or after a fall, 2,212 adults were analyzed during a 20-month period. FOF and fall incidence were found to be independent predictors of each other. Moreover, in a systematic meta-analysis of community dwelling older adults (60+ years) across four countries including

Canada (Filiatrault & Desrosiers, 2011), Korea (Kim & So, 2013), U.S. (Dierking et al., 2016; Lach, 2005) and Spain (Lavedán et al., 2018) the presence of FOF (analyzed by a simple Likert question for variability) resulted in a 12-fold increase in falling when compared to adults who did not have FOF (Pena et al., 2019). Additionally, during a longitudinal 2-year study, the risk of community dwelling adults reporting FOF increased by 4 times if they had two or more falls, 1.88 times if they felt unsteady, and 1.72 time if they exhibited a decrease in health status (Lach, 2005).

About 26% of older women report FOF, while 56% of adults aged 80 and over report FOF (Lach, 2005). Likewise, in a cross-sectional study, 36% of community dwelling older adults reported moderate or higher levels of FOF (Boyd & Stevens, 2009). FOF is also highly prevalent in adults who have functional limitations such as difficulty with balance and mobility, having to use a walking aid (Denkinger et al., 2015) or having Parkinson's disease. Some researchers suggest that fear of falling may cause falls due to increased anxiety having a negative effect on postural stability (Young & Mark Williams, 2015). Regardless, the prevalence of FOF is greater among fallers than non-fallers and should not be overlooked when addressing falls. Denkinger et al. (2015) suggests that when assessing fear of falls in relation to fall risk, that gender, comorbidity, self-perceived health, history of falls, depression, and one performance-based question should always be asked to better understand the relationship.

Chronic health conditions such as stroke, cancer, kidney disease, arthritis, depression, diabetes, angina, asthma, chronic obstructive pulmonary disease (COPD), osteoporosis, mild and severe cognitive impairment, urinary incontinence, dizziness,

vertigo, moderate and severe pain, and Parkinson's have all been linked with falls (Immonen et al., 2020; Paliwal et al., 2017; Deandrea et al., 2010; Tromp et al., 2001). After analyzing 2014 Behavioral Risk Factor Surveillance System (BRFSS) national survey data of adults 65 year and older, Paliwal et al. (2017) found adults who had a history of either stroke, cancer, kidney disease, arthritis, depression, and diabetes were at increased risk of experiencing a fall for the first time. Additionally, they found older adults who had a history of either diabetes, depression, COPD, chronic kidney disease, arthritis, asthma, stroke, angina, and heart attack were at risk of recurrent falls.

Elderly adults with neurological conditions such as stroke, Parkinson's, dementia, epilepsy, peripheral neuropathy, peripheral nerve lesion are three times at higher risk of falling than older adults (Homann et al., 2013). Moreover, adults with stroke are six times and adults with Parkinson's are five times more likely to experience a fall compared to healthy adults. Likewise, adults with Chronic musculoskeletal pain (CMP) in the joints often have mobility restrictions and reduced Health Related Quality Of Life (HRQOL) scores placing them at high risk of falls (Stubbs et al., 2016). Leveille et al., (2009) found adults aged 70 years with two or more locations (in either the hands, wrist, back, chest, hips, feet, knee, or shoulders) of musculoskeletal pain fell more frequently. Additionally, they found adults who fell more frequently reported higher levels of pain and pain interfering with daily activities.

Comorbidity also increases the risk of falls (Immonen et al., 2020; Gale et al., 2016; Deandrea et al., 2010). Older adults who have comorbidity are at risk of losing mobility and their risk of falling increases as the number of chronic conditions increase

(Guralnik et al., 1993). Deandrea et al., (2010) found adding one medical condition increased the chance of falling by 1.2 times and 1.4 times for recurrent fallers. Another study found recurrent fallers were more likely to report having 2-5 chronic diseases compared to non-fallers and having five or more chronic diseases were significantly associated with recurrent falls (Immonen et al., 2020).

Research has shown a higher prevalence of dementia in adults with a history of falls and gait impairment (Zhang et al., 2019). Executive function provides attention and inhibitory responses to external stimuli and is important for maintaining balance during walking and standing. Adults with cognitive impairments like Parkinson often have difficulty prioritizing their balance over secondary stimuli placing them at greater risk of falling. Moreover, deficits in executive function have been found to double the risk of falls for community dwelling older adults and increase the risk of an injurious fall by 40% (Boron, 2019). A ten-year study found older adults with reduced processing speed and executive function were at higher risk of falling. Additionally, they found a 10% increased risk of an injurious fall for each standard deviation decrease in processing speed among older adult (Welmer et al., 2016).

Cognitive deficits are also more prevalent as adults get older (Bridenbaugh & Kressig, 2020). A study found that mild cognitive deficits in older adults, determined by the mini mental state exam (MMSE) were associated with an increased risk of falls. The MMSE is a 30-point scale. For each point missed, the risk of fall increased. For example, individuals who scored 28 out of 30 had a threefold increased risk of falling compared to adults who scored a perfect 30. This association persisted even after controlling for

assistive device, activities of daily living, and exercise levels. Last, cognitively impaired adults who fall are five times more likely to get admitted to an institution compared to an older adult with cognitive impairments who has never fallen.

Several classes of medication are associated with an increase of fall and are referred to as Fall Risk Increasing Drugs (FRIDS). Polypharmacy, the regular use of four or more medications has also been commonly considered a fall risk factor (Hammond & Wilson, 2013). Between 1988 to 2010, the proportion of older adults taking five or more medications tripled and the average number of total medications doubled from 2 to 4 (Charlesworth et al., 2015). Polypharmacy's association with falls is significantly stronger when certain FRIDS or Potentially Inappropriate Medications (PIM) are prescribed (Hammond & Wilson, 2013).

The majority of FRIDS are composed of drugs that affect a person's central nervous system. Additionally, the American Geriatrics Society (AGS) Beer Criteria for PIM specifies antiepileptics and psychoactive (antipsychotics, antidepressants such as Tricyclic antidepressants (TCAs), Selective serotonin reuptake inhibitors (SSRIs), Serotonin and norepinephrine inhibitors (SNRIs), benzodiazepines, and nonbenzodiazepine specifically eszopiclone, zaleplon, and zolpidem and opioids) medications are FRIDS (American Geriatrics Society Beers Criteria® Update Expert Panel, 2019). Despite the known risks of these medications, a cross-sectional analysis of National Vital Statistics (NVSS) and medical expenditure panel survey (MEPS) from 1999 to 2017 showed older adults had 7.8 billion FRIDS prescribed and the percentage of older adults taking one FRID increased from 57% to 94% (Shaver et al., 2020).

Psychoactive drugs have commonly been identified in studies as increasing the risk of falls. Sedative-hypnotics FRIDS, drugs that depress the central nervous system and whose dosage effects the type of depression can be separated into two classes: benzodiazepine and nonbenzodiazepine. Benzodiazepines can be used to manage anxiety, insomnia, seizures, acute alcohol withdrawal or as muscle relaxants. They are thought to increase the risk of falls because they increase drowsiness, relax muscle, and decrease cognitive function (increased reaction time and poor concentration) which all decrease postural stability when standing or walking. Adding two or more benzodiazepines to an older patient doubles their risk of falling (Hartikainen et al., 2007). The generic drug named *diazepam* commonly known as the brand name *Valium*, a drug used to manage anxiety, seizures and muscle spasms was specifically identified as FRID. A study found adults who took *diazepam* were 3.7 times more likely than adults who didn't take this medication to have two or more falls and their odds of falling increased to 5.3 when they were prescribed the medication for a year (Cumming et al., 1991). This increased risk of falling demonstrates the profound risk of long-term continuous use of Benzodiazepines. Indeed, they are not recommended for long-term use due to tolerance that may develop and other negative effects such as cognitive impairment and visuospatial issues. However, between 2014-2016 older women were prescribed benzodiazepines at a higher rate than any other age group (Santo et al., 2020).

Nonbenzodiazepines are another sedative hypnotic FRID that have similar effects as benzodiazepines but are chemically different (Neubauer, 2012). They are primarily used as sleep medications and cause psychomotor slowing which places older adults at an

increased risk of falling. Three nonbenzodiazepines generic names have been identified as placing individuals at increased risk of falls and fractures: *Eszopiclone* (known as the brand name *Lunesta*), *zaleplon* (known as the brand name, *Sonata*), and *zolpidem* (known as the brand name *Ambien*) (American Geriatrics Society Beers Criteria® Update Expert Panel, 2019).

Another psychoactive medication that has also been associated with falls and fractures is antidepressants. Antidepressants are generally used to treat depression but can also be used for anxiety, neuropathic pain, and post-traumatic stress disorder (PTSD). Their side effects can include sleep disturbances, dizziness, and impaired balance. It is believed decreased reaction times, disturbances in sleep and orthostatic hypotension may increase the risk of falls for antidepressant takers. In a longitudinal study of antidepressants and falls, recurrent falls were significantly associated with intake of antidepressant drugs. Moreover, older adults who use antidepressants were 83% more likely to fall than non-users (Marcum et al., 2016). The three subclasses anti-depressants associated with falls include Tricyclic antidepressants (TCAs), and selective serotonin reuptake inhibitors (SSRIs), and Serotonin-Norepinephrine Reuptake inhibitors (SNRIs). A systematic review of literature from 1996-2004 of older adults showed Tricyclic antidepressants (TCAs) and selective serotonin reuptake inhibitors (SSRIs) increased risk for fall related hip fracture by 4.76 and 6.30 respectively. Moreover, *fluoxetine*, and *paroxetine* were specific TCAs found to be related to a higher risk of falls (Hartikainen et al., 2007).

Antipsychotic medications (psychoactive medication) have also been associated with an increased risk of falls and fractures. These drugs are generally taken to treat conditions such as schizophrenia, bipolar, anxiety, PTSD, and Attention-Deficit Hyperactivity Disorder (ADHD). The atypical antipsychotic *risperidone* increased the risk of falls by 1.26 (Hartikainen et al., 2007). Two other central nervous system drugs, opioids (a psychoactive medication) and anti-epileptics have also been associated with increased risk of falls.

Other drugs associated with increased risk of fall include drugs used to lower blood pressure such as diuretics and calcium channel blockers like *diltiazem* (Hartikainen et al., 2007). Older adults risk of multiple falls increased by 1.8 in those prescribed diuretics and 1.2 for nitroglycerin. In older adults who had these medications prescribed for a year, their risk of falling increased by 2.2 for both diuretics and diltiazem (Cumming et al., 1991). The researchers suggested diuretics and diltiazem are risk factors because they may cause hypotension and cardiac arrhythmia.

Other recent studies found the use of two other cardiovascular drugs, anti-arrhythmic and non-selective beta blockers increase fall risk in community dwelling older adults (Ham et al., 2014). This research suggests that bradycardia or hypotension as a result of these medications increase the risk of falls for older adults prescribed these medications.

Sensory deficits such as vestibular dysfunction, somatosensory system (proprioceptive) vision deficits, and hearing loss, can decrease postural stability in an older individual (Tinetti & Speechley, 1989). Visual deficit is an independent risk factor

for falls. The visual system allows an individual to visually perceive their environment (Tobis et al., 1985). Deficits in the visual system caused by either diseases, or visual abnormalities prevalent in older adults are associated with reoccurring falls, fractures, and decreased postural stability. Moreover, visual cognition aids in perceiving the environment and recognizing hazards. Visual cognition is broken down into visual attention, visual-spatial ability, and visual processing. Decreases in any of these components have been associated with falls. For instance, lower visual attention is associated with increased chance of interacting with obstacles while walking and visual processing is associated with slower saccadic eye movement and stepping errors.

The visual sensory system processes the environment by separating it into color, motion, orientation, texture, and depth (Tovée, 1996). Eye conditions such as presbyopia, glaucoma, cataracts, macular degeneration, diabetic retinopathy are prevalent in older adults and can affect the visual processing system (Reed-Jones et al., 2013; Kornzweig, 1977). Individuals with presbyopia have difficulty seeing things closely and will often need bifocal, trifocal or multifocal lenses. Older adults who wear these lenses are at risk of falling because it diminishes their depth perception and contrast sensitivity. For example, older adults who wear bifocal lenses are at risk of injurious outdoor falls, and individuals who wear multifocal lenses are two times more likely to fall than other older adults. In addition, individuals who have glaucoma are at an increased risk of falling because of impaired peripheral vision caused by damaged optic nerve. Also, older adults with macular degeneration are at increased risk of falling because of decreased recognition of color, straight lines, and blurry vision. Other eye deficits prevalent in older

adults besides peripheral vision, contrast sensitivity, and visual acuity include decreased night vision (adaptation to dark). Furthermore, drugs such as anti-arrhythmic (amiodarone), anticholinergics, anti-epileptics, corticosteroids, cardiac glycosides, and erectile dysfunction medications can also affect visual perception, and thus further increase the risk of falls.

The severity of an older adult's visual impairment affects their ability to conduct activities of daily living. For example, the percentage of adults reporting difficulty conducting activity of daily living increased with minor, moderate, and severe deficits respectively: 18%, 25%, and 43% (Hochberg et al., 2012). Visual impairments are also associated with fear of falling that may further decrease participation in activities of daily living (Tobis et al., 1985).

The vestibular system provides proprioceptive feedback about the position of the body and assists with maintenance of balance (Purves et al., 2001). Older adults with vestibular dysfunction symptoms such as dizziness are 12 times more likely to fall (Agrawak et al., 2009). An important component of the vestibular system is in the inner ear for its ability to sense the direction and motion of the head and body. Additionally, the vestibular system is important for postural reflexes and eye movements. Vestibular dysfunctions decrease an older adult's spatial orientation and eye movement at rest. As part of normal aging, older adults experience reductions in the vestibular organs (Rosenhall & Rubin, 1975). Additionally, osteoporosis, saccular degeneration, medications, alcohol use and traumatic brain injuries are among other factors that may

negatively affect the vestibular function in older adults (Overstall et al., 1981; Tinetti & Speechley, 1989).

The somatosensory system, a system of sensory cells that provide perception of touch, pressure, pain, temperature, position, movement, and vibration, which arise from the muscles, joints, skin, and fascia, discriminates between position and movements of body parts. Somatosensory system provides feedback regarding balance and stability during position changes such as walking on uneven surfaces. Peripheral neuropathies because of diabetes or vitamin B12 deficiency may cause changes to the somatosensory system. For example, one study comparing older adults with somatosensory loss associated diabetic polyneuropathy showed these individuals had 40-50% larger postural sway. These changes can place an individual at risk of falling. Other disturbances to the somatosensory system can result from cervical spondylosis, arthritis, or damage to mechanoreceptors in the apophyseal joints (Wyke, 1979).

Functional limitations associated with balance and gait deficits are among the top two factors, besides the history of falls, used to identify adults who are at high risk of falls. (Guirguis-Blake et al., 2018; American Geriatrics Society and British Geriatrics Society, 2011; Ganz et al., 2007). Adults with gait and balance deficits are 1.7 to 2.4 times more likely to fall. Additionally, 20-50% of older adults are likely to have balance and gait deficits (Ganz et al., 2007; Alexander, 1996). Recommended methods of assessing gait and balance deficits included 1) asking adults if they have issues with their balance and mobility, 2) conducting functional assessments such as a Sit-to-Stand or Timed-up-and-go (TUG) or 3) conducting manual muscle testing for strength and range

of motion. Typical signs of balance deficits may include slow walking, using a wider stance, shuffling while walking, swaying from side to side, having a stooped posture and using an assisted device to walk.

Older adults are more likely to have increased postural sway during standing, which are deviations from the vertical upright standing (Sheldon, 1963). For example, increased age is associated with increased sway energy ratio and sway area with eyes open. Additionally, when older adults close their eyes while standing, postural sway is amplified to a greater extent than young adults (Horak et al., 1989; Sheldon, 1963). Postural disturbances in the anterior and posterior direction (e.g., push, trip) are often corrected using three fall prevention postural strategies. The first is the ankle strategy which consists of the center of mass moving about the ankle joints and is used as postural correction when the surface is flat, wide and during small disturbances. The second is the hip strategy, which consists of the center of mass repositioning through hip extension or flexion when the surface is smaller, is not slippery, and the disturbance is faster or larger. The final postural correction is the stepping strategy that moves the base of support in the direction of the center of mass and is used during faster and larger disturbances in which the hip and ankle strategy would not suffice. The way an individual chooses to use postural strategies during disturbances depends on prior experience, sensory and neurologic deficits. Moreover, these postural corrections to prevent falling rely on the vestibular, visual, and somatosensory system to provide sensory feedback, and the musculoskeletal system to rapidly contract in a specific order depend on the postural strategy. Impairments to this process resulting from disease or even just natural aging can

negatively affect postural stability and fall risk. For example, older adults with Parkinson's disease activated their leg muscles but failed to elicit a fall prevention postural strategy during a disturbance (Horak et al., 1989). Additionally, older adults with hemiplegia demonstrate correct but delayed muscle activation, resulting in a delayed execution of a fall prevention postural strategy and inability to maintain postural stability (Garland et al., 1997).

In addition to decrease postural stability during standing, A variety of age-related changes in walking gait performance are also closely associated with fall risk among older adults. Community dwelling older adults who have fallen show increased gait unsteadiness compared to non-fallers and younger adults. For example, "fallers" are typically slower and spend more time with both feet in contact with the ground during walking. Although older adults who fell performed worse than older non-fallers, it is interesting to note that adults who had not fallen performed worse than the younger population. In fact, decreased gait performance affects about 20 to 40% of older adults 65 year and over and 40-50% of adults 85 year and over (Hausdorff et al., 1997). These observed declines in postural stability and gait performance are often associated with impaired sensory perception and reduced muscle strength. Musculoskeletal deficits, especially lower extremity weakness increase the risk of falls by impairing an individual's gait and balance. Sarcopenia is the loss of muscle with age, and it is often caused by chronic conditions, medications, sedentary lifestyles, disabilities, or undernourishment. Musculoskeletal deficits are prevalent in healthy older adults as indicated in a study assessing isometric and isokinetic knee muscle torques of three age

groups between 20 to 86 years (Murray et al., 1980). The prevalence of musculoskeletal deficits increases with frailty. About 57% of older adults who reside in nursing homes and 80% of older adults in skilled nursing homes have lower extremity weakness (Robbins et al., 1989; Tinetti & Speechley, 1989). Lower extremity weakness can occur because of medications, decreased physical activity, chronic diseases, or disabilities. The odds ratio for any falls among community dwelling adults with lower extremity weakness is 1.76, while for upper extremity it is 1.53 (J. D. Moreland et al., 2004). Additionally, the odds ratio for recurrent falls in community adults with lower extremity is 3.06, while for upper extremity it is 1.41.

Functional limitations associated with fall risk are closely linked to increased need for physical assistance. Adults who need assistance with activities of daily living (ADLs) are two times more likely to be at risk for falling. About 20% of community dwelling older adults require assistance with ADLs, and older adults who report difficulty with ADLs have been shown to experience more falls and fall related injuries. For example, when compared to non-fallers, older adults who fell once and sustained an injury were 1.78 more likely to report difficulty with ADLs. Moreover, older adults with more than two falls were 2.36 times more likely to report difficulty with ADLs compared to non-fallers, while adults with more than two falls and one injury were 3.75 times more likely to report difficulty with ADLs. Finally, among older adults (71+ years), a single fall without injury decreased their ADL and as the number of falls and injuries increased, ADLs decreases (Tinetti & Williams, 1998)

Lifestyle behaviors

Lifestyle behaviors such as cigarette smoking, alcohol consumption, and physical activity are fall risk factors that have been identified as modifiable fall risk factors.

Cigarette smoking is a risk factor due to its association with other risk factors such as cancer, cardiovascular disease, cognitive impairment, and muscle loss (Marques et al., 2020; Okusaga et al., 2013). Moreover, Marques et al. (2010) found men who smoked had lower quadricep cross-sectional area and muscle activation while female smokers had lower quadricep cross-sectional area, lower muscle activation and peak torque.

Adults who consume 14 or more alcoholic drinks in a week are 25% more likely to fall compared to nondrinkers. Older adults who drink alcohol may be at risk of falling due to alcohol related cognitive impairments, and lower extremity weakness and balance losses (Makamal et al., 2004). About 18-39% of older adults take alcohol interactive medications such as psychoactive medications that further impair central nervous system function and are at greater risk of falling. Risk factors for increased drinking include being a male, having higher income, being married, smoking, increased mobility, having chronic conditions, polypharmacy, and poor psychological wellbeing such as depression. Risk factors for the combined use of alcohol and interactive medications include, living in a rural community or small town, polypharmacy, poor social network and having a higher education and income (Holton et al., 2017).

Older adults with high and low levels of physical activity are at risk of falling. For example, in a prospective cohort study of 5,995 community dwelling older men, higher levels of physical activity (assessed by the Physical Activity Scale for the Elderly

[PASE]) were associated with falls (Chan et al., 2006). Additionally, about 66% of the total PASE score was related to household chores such as home repairs and gardening. This has perplexed researchers as physical activity in the form of exercise is highly recommended in the prevention of falls. Tinetti et al. (1995) also found community dwelling adults 72 year and older who participate in increased levels of physical activity are at higher risk of injurious falls and described the trend as “complex”. In a study of healthy (no neurological, cognitive, or other factors that may affect balance and mobility) female community dwelling adults aged 70 year and older, 49% of participants fell during the 12-month study (Hill et al., 1999). These female older adults had higher physical activity scores (indicated through the Normative Impairment Index [NII]) and reported higher levels of physical activity outside their home. Interestingly, 47% of these falls occurred outdoors, while only 26% fell indoors. Moreover, 9% of falls resulted in fractures, 26% had minor injuries such as bruises, and 10% reported strains. Therefore, researchers speculated these healthy female adults were falling because of their willingness to conduct higher risk activities such as climbing ladders and therefore being exposed to a higher risk of falls. The researchers also speculated injuries might be related to increased momentum during impact due to higher velocity during physical activity such as walking. This study was one of the first to suggest healthy older adults should not be neglected during fall risk assessments because of their increased risk of falling and higher chance of injurious falls. Similarly, another study (case-study) focusing on risk profiles for outdoor and indoor falls, found outdoor falls were strongly associated with

higher levels of physical activity even after adjusting for demographics such as age, gender, education, race, and ethnicity (W. Li et al., 2006).

Adults with low physical activity levels are also at an increased risk for falls. Older adults with low physical activity are likely to have chronic diseases (Watson et al., 2016), muscle weakness, higher body fat, and need assistance with activities of daily living (ADL) (Langhammer et al., 2018). In 2014, the Center for Disease Control (CDC) found 26.9% of adults aged 65-74 years and 35.3% of adults over the age of 75 years were physically inactive (Watson et al., 2016). Continuing physical activity in life has been shown to sustain independence in older people, restore functional capacity, improve overall health and immunity, reduce sleep disturbance, reduce depression and incidence of chronic conditions (cardiovascular diseases, diabetes, breast and prostate cancer, dementia, and Alzheimer's) and prevent cognitive decline (Cunningham et al., 2020; Langhammer et al., 2018; Shephard, 1997). The U.S. Department of Health and Human Services recommends adult aged 65 year and older do at least 150 minutes of moderate-intensity aerobic activity (30 minutes a day for five days) during the week or 75 minutes of vigorous activity with at least 2 days of muscle-strengthening activities (including all major muscle groups such as legs, hips, abdomen, chest, shoulder, and arms) (U.S. Department of Health and Human Services, 2018). The U.S. Department of Health and Human Services, also recommends that older adults do exercises, a form of physical activity that is planned and has an objective (Langhammer et al., 2018), to improve balance if individuals are at risk of falling.

Extrinsic risk factors

Extrinsic risk factors (environmental risk factors) are defined as risk factors outside the body such as home and outdoor hazards and shoe wear. These risk factors are modifiable and are reported in about 30-50% of falls (Rubenstein, 2006). Common environmental fall hazards include staircases without railing, clutter on floor, rugs that are not secure to the ground such as throw rugs, poor lighting, absence, presence of grab bars in showers or near toilets, items at hard-to-reach areas, toilet, beds too high or too low, and pets near an individual (Pynoos et al., 2012). Additionally, indoor environmental hazards have commonly been found in the living room, at the entrance to the house, bedroom, stairs, bathrooms, and hallways (Pynoos et al., 2012; W. Li et al., 2006). Common areas where falls occur outside include sidewalks, streets, curbs, gardens, porches, outdoor stairs, parking garages and parks (W. Li et al., 2006).

Environmental hazards are determined to cause falls if a specific hazard is identified, if an individual slipped or tripped over an item, or if the fall occurred during a change of level such as stairs. Hazards affect individuals in relationship to their behavior, specifically with physical activity levels. Interestingly, both physically active and frail older adults are at risk of falling due to environmental hazards, but the type and location of environmental hazards differ. For example, falls among physically active older adults are more likely to result from outdoor environmental hazards and it has been speculated their increased physical activity levels increases their rate of exposure to these environmental hazards (Kelsey et al., 2010). Physically active adults fall indoors too and their risk of falling indoors increases with the presence of hazards (Northridge et al.,

1995). On the other hand, frail older adults fall two times more than physically active adults but their falls typically involve a greater interaction of intrinsic and extrinsic risk factors. (Tinetti & Speechley, 1989). Moreover, frail older adults are more likely to fall indoors, and they are more likely to be of older female gender. Frail older adults are also more likely to take psychoactive medications, have lower levels of cognition and have poorer health; all factors that further exacerbate fall risk.

About 53% of older adults fall indoors, while 47% fall outdoors (Kelsey et al., 2010). Most older adults will age in their owned or rented homes (Wellman, 2010). In 2018, the percentage of older adults living in nursing was 1% for adults aged 65-74 years, 2% for adults aged 75-84 years and 7% for adults aged 85 years and over (Administration for Community Living, 2020). Therefore, identifying hazards at home is crucial to enhancing the safety of our older adults aging in place and reducing the risk of falls. When assisting older adults identify home hazards it is important to note differences may be found geographically and culturally (Romli et al., 2018).

Another modifiable environmental fall risk factor is footwear (Hatton & Rome, 2019). Footwear affects postural balance by varying foot and ankle somatosensory feedback in around the ankle and foot as well as frictional conditions at the bottom of the foot (Menant et al., 2008). Choosing the appropriate footwear can prevent balance problems that may arise from wearing heels, slippers, and sandals or high heels. A study on community dwelling older adults found adults who were barefoot, or wearing just socks, or slippers were 2.5 times more likely to suffer a serious injury after falling (Kelsey et al., 2010). Additionally, the prevalence of being barefoot, wearing socks or

slippers was 51.9% in those who fell. In a New Zealand study, 37% of institutionalized adults reported wearing slippers indoors (Kerse et al., 2004). Moreover, heel height of 2.5 cm or greater was positively associated with fall risk (Tencer et al., 2004). Similarly, greater footwear sole contact area has been found to decrease risk of falling.

Multifactorial interventions that have included changes in footwear saw 36% fewer falls (Spink et al., 2011). Choosing appropriate footwear can be useful for patients who have diseases that may affect proprioception such as neuropathy found in diabetic patients and arthritis.

Fall Prevention

There are various preventative guidelines and tools available to screen “at risk” fall populations, assess, and prevent falls in older adults. Prevention of falls begins with health care provider awareness of fall risk factors and prevention strategies. Fortunately for health care providers, the American Geriatrics Society and British Geriatrics Society (AGS/BGS) as well as the US Preventive Services Task Force (USPSTF) have created fall prevention guidelines which include screening for “at risk” fall populations. The AGS/BGS recommend screening for previous falls and asking older adults if they have difficulty with their gait and balance (American Geriatrics Society and British Geriatrics Society, 2011). The frequency of the falls and circumstance should be annotated as well as if the member presented to the emergency services after a fall. An adult who reports recurrent falls (two or more falls) or has difficulty during balance and mobility assessments should have a multifactorial risk assessment. Similarly, the USPSTF

recommends screening all adults 65 years and over for falls and functional limitations (Guirguis-Blake et al., 2018). Despite best practices available, just over one third of providers ask about fall history (Smith et al., 2015; Tinetti & Speechley, 1989). In one survey of Massachusetts providers, only 52% of providers felt they had the expertise to conduct fall risk assessments (Howland et al., 2018).

Stopping Elderly Accidents, Deaths, and Injuries (STEADI) is fall prevention toolkit created by the Centers for Disease Control and Prevention's Injury Center to assist health care providers with fall prevention (Stevens & Phelan, 2013). Using AGS/BGS suggestions, the STEADI tool consists of three elements which are (1) screening patients for fall risk, (2) assessing modifiable risk factors and (3) intervening by using effective clinical and community guidelines. Screening tools consist of either a three-question tool about balance and gait, fear of falling, and fall history or a 12-question tool. The 12-question tool consists of checking whether (1) an individual has fallen in the past year, (2) an individual has been advised to use a cane or walker to get around safely, (3) an individual feels unsteady when they are walking, (4) an individual needs to hold on to furniture to steady themselves, (5) an individual is worried about falling, (6) an individual needs assistance standing up from sitting, (7) has difficulty stepping onto a curb, (8) has to rush to the toilet, (9) has lost feeling in their feet, (10) takes medicine that sometimes makes them feel light-headed or more tired than usual (11) takes medicine to help them sleep or improve their mood, (12) feels sad or depressed. After screening, providers are advised to recommend "not at risk" older adults education, vitamin D if deficient, community exercise or fall prevention programs, and fall screenings yearly or anytime an

individual has fallen. Providers who find “at risk” individuals are advised to further evaluate for other risk factors. STEADI recommends assessing older adult’s gait, strength, and balance using either the “Timed up and Go”, “4-Stage”, 30-Second Chair Stand, or “Balance Test”, identifying any FRIDS, inquiring about potential home hazards, checking standing and lying orthostatic pressure, visual acuity, feet/footwear, vitamin D intake and chronic conditions. Fall prevention for “at risk individuals” consist of referring older adults to physical therapy or community exercise or fall prevention programs for gait, strength, and balance, adjusting medications, referring to an occupational therapist for home safety evaluation, management of orthostatic hypotension, managing visual impairments through medication adjustment, education on lenses, or referral to ophthalmologist or optometrist, referring to podiatrist for feet issues or education on proper footwear, vitamin D recommendation if deficient, or addressing chronic health conditions. Interestingly, a survey conducted with Massachusetts providers found only 14% of providers were aware of the STEADI toolkit, demonstrating a need to educate providers on fall prevention (Howland et al., 2018).

Unfortunately, the problem with screening fall history is that only about half of older adults report their falls. Often, falls are caused by multifactorial reasons which can include a combination of modifiable risk factors such as behaviors, and intrinsic and extrinsic risk factors. Inquiring about other risk factors such as behaviors can give a better understanding of “at-risk” individuals. For example, physical activity behavior should be assessed as individuals who have high physical activity levels are at risk of injurious falls and are often overlooked (Chan et al., 2006; W. Li et al., 2006; Hill et al.,

1999; Tinetti et al., 1995). Moreover, a systematic review and meta-analysis of screening tools found no single measure could accurately predict community-dwelling fallers because falls are generally multifactorial. Researchers suggest using a comprehensive assessment of both intrinsic and extrinsic risk factors. For example, Lusardi et al., (2017) was able to better identify at risk individuals by using combination of performance-based measures (Single Leg Stance [SLS] with eyes open, Self-Selected Walking Speed [SWSS], Berg Balance Scale [BBS] combined with Timed Up and Go [TUG] or Five Times Sit-to-Stand Test [5TSTS]) medical history questions (history of falls, ADL difficulty, use of ambulatory device, concern about falling, and use of psychoactive medications) and self-report measures (Falls Efficacy Scale International [FES-I] and Geriatric Depression Scale-15 [GDS-15]) (Lusardi et al., 2017).

Older adults can also benefit from hazard reduction in their homes. There is an abundance of home hazard checklists, but many are not standardized. Home Hazard assessments are often used as part of a multifactorial interventions or as a single intervention. Studies have found home hazard assessments and modifications reduce falls among older adults (Romli et al., 2018). A systematic review of home hazard assessments for community dwelling older adults identified Home Falls and Accidents Screening Tool (HOME FAST), Westmead Home Safety Assessment (WeHSA), Home Safety Assessment Tool (HSSAT), In-Home Occupational Performance Evaluation (I-Hope) as having good psychometric properties. The HOME FAST, WeHSA and HSSAT focused on person-environment interaction, while I-Hope focused on an on an individual's functional activities at home. The HOME FAST was the most accessible, shortest in

duration (20 minutes), required minimal training and was designed for at risk older adults. The WeHSA was recommended for use as an occupational therapist while the HSSAT was recommended for adults who wish to conduct their own assessment at home (Romli et al., 2018). Multifactorial interventions for frail and recurrent fallers that involved occupational therapy or physical therapy and home hazard assessment had a 31% to 36% reduction in falls. (Davison et al., 2005; Nikolaus & Bach, 2003).

Older adults can also benefit from exercise interventions regardless of if they have balance, strength, and mobility issues. A systematic and metanalysis review of exercise interventions found the overall number of falls among healthy older adults aged 65 years and older were significantly reduced by 32% and the total number of individuals falling was also reduced by 22% (Hamed et al., 2018). Additionally, a study of frail older female adults, demonstrated a 25% reduction in fall risk through exercise intervention (Hauer et al., 2001). Studies have also shown that exercise interventions alone can reduce falls and injurious falls (Guirguis-Blake et al., 2018). Evidence based fall prevention programs such as A Matter of Balance (AMOB), Otago Exercise Program, Stay Active and Independent for Life (SAIL), Tai Chi: Moving for Better Balance all incorporate exercise and may reduce falls by increasing strength, flexibility, reaction time and balance (Carter et al., 2001). AMOB is a program that has widely been disseminated, but providers often are not aware of these community programs. For example, in Massachusetts, only 15% of providers surveyed were aware of AMOB (Howland et al., 2018). Another study found, despite Tai Chi's documented fall prevention evidence, less than 15% of providers discussed Tai Chi as a prevention (Howland et al., 2018).

Fall prevention coalitions

Fall Prevention Coalitions are groups involving multiple sectors of the community that come together to address community needs regarding falls and solve community problems (Beattie & Schneider, 2015; Wolff, 2001). These fall prevention coalitions can help bridge the gap in areas where access to care is limited. Additionally, they can create a common platform in which organizations address falls, raise public awareness of fall risk across all stakeholders, identify gaps in fall prevention resource usage and allocate resources to appropriate locations. The National Council of Aging developed guidelines for state coalition building (Beattie & Schneider, 2015). These guidelines are broken down into three major steps: formation stage, maintenance stage, and institutionalization Stage. The formation stage involves four steps. These include reviewing the *Falls Free®: 2015 National Fall Prevention Action Plan* (a national plan for addressing falls), identifying key partners, making a case for fall prevention, and creating a planning group. The maintenance stage involves developing the coalition group's mission, goals, and objectives, as well as launching the fall prevention coalition. The final stage called the institutionalization stage involves sustaining the coalition, networking and evaluating the coalition and its progress.

Additionally, the Centers for Disease Control and Prevention developed guidelines for implementing effective community-based fall prevention programs (2015). Besides understanding fall risk factors, building partnerships or coalitions to address falls, the CDC emphasized understanding community needs to identify suitable resources such as evidenced based fall prevention programs (National Center for Injury Prevention

and Control, 2015). Thus, a key to understanding fall risk and the most appropriate fall prevention interventions for a community is to 1) identify fall risk, 2) identify the prevalence of behavioral, intrinsic, and extrinsic fall risk factors, and 3) the access to fall prevention programming...as these all relate to geographic area.

Geographic information systems (GIS)

Geographic information systems (GIS) have recently gained momentum as a means of identifying fall prevention programming needs. GIS is a powerful tool that can be used to gather, analyze, and manage data. It can be used to analyze spatial location and organize layers of information into visualizations using maps, to reveal deeper insights into data, such as patterns and relationships. For example, Yiannakoulis et al. (2003), used GIS to describe emergency department reported fall patterns of community adults aged 66 years and older in Canada. Their GIS data revealed that the inner city of Edmonton had a high incidence of calls, followed by rural and small communities, while suburban areas demonstrated lower incidence rates. The results of this study were the first to show the potential usage of GIS in fall prevention. In 2011, Carlson et al. used GIS to identify possible fall prevention sites that were within 10 minutes' drive of high densities of older adults in Pierce County, Washington. This site suitability analysis resulted in an 80% increase in adults attending fall prevention programs (Carlson et al., 2011).

In Texas, GIS was used to map emergency fall-related services and locations of AMOB fall prevention programs. The spatial analysis showed high emergency fall services in zip codes where fall preventions were located (Smith et al., 2017). There were several suggestions from this study. First, they suggested mapping fall injuries and

other factors for a better understanding of the environment. Second, they suggested mapping other fall prevention programs including community fall prevention stakeholders to enhance the research process and ensure the needs of the community are met.

Fall Risk and prevention in rural communities

In rural areas, access to health care can create a barrier in identifying older adults at risk for falls and screening for risk factors. A recent survey disseminated to rural communities revealed access to health services such as emergency services, insurance and primary care were a top concern (Bolin et al., 2015). Lack of health care resources such a primary care providers, physical therapists, occupational therapists, and home care nurses can make it difficult to focus on fall prevention and coordinate care due to insufficient time and expertise for falls (Tinetti et al., 2006). Moreover, injury costs are higher in rural areas (Coben et al., 2009). These higher costs may result from a combination of outsourcing providers and medical attention needed because of injury. Additionally, older adults who live in rural areas may be geographically isolated and this may prevent them from accessing local fall prevention resources as well.

To make matters worse, health behaviors associated with falls are highly prevalent in rural areas. It has been consistently noted that culturally sensitive approaches are needed in modifying health behaviors because health-related behaviors are embedded within an individual's community. Moreover, addressing health issues in rural health such as falls, requires different methods of detecting risk factors because cultures differ across geographic locations. (Hartley, 2004).

Humboldt and Del Norte Counties.

Humboldt and Del Norte are two of California's most northwest rural counties. These two counties contain a higher percentage of older adults 65 years and older (17.9%) compared to California (14.3%). They are also home to 11 Native American tribes. Like other rural areas, these counties have health care challenges such as provider shortage in primary care and behavioral health, and high death rates from accidents, alcohol, and drugs (California Health Care Foundation, 2020).

These counties also have very limited medical services in the most rural areas. Screening older adults for fall risk may be challenging due to the geographic isolation of each county's population. However, to prevent falls, screening and identification of at-risk populations should be conducted. In 2010, the Redwood Coast Region (Del Norte, Humboldt, Mendocino, and Trinity Counties) reported increased falls in the past 12 months and higher percentage of falls compared to California (Jones, 2010). This report addressed the need to use all community members including city and county planning departments like Public Health, local organizations like Area 1 Agency on Aging, local physical and occupational therapists, any health care providers and friends and neighbors to prevent falls. This urged local fall prevention efforts and in 2019 led to the creation of the North Coast Fall Prevention Coalition (a coalition of 19 local agencies) and the eventual purpose of this study.

Statement of Research Purpose

The purpose of this study was 1) to administer the *North Coast Fall Prevention (NCFP) Survey* to assess fall risk factors and fall prevention needs of adults 60 years and older living in Humboldt and Del Norte counties, and 2) to analyze spatial location and organize layers of the *NCFP* survey to reveal deeper insights into the data.

METHODS

Participants and Area of Study

Participants included 615 Humboldt County residents across 35 zip codes, and 147 Del Norte residents across four zip codes aged 60 years and over. Humboldt County is 3,567.99 square miles and has about 37.7 people per square mile. The total population of Humboldt County in 2020 was 136,465 and the total older adult population was 34,079 (U.S. Census Bureau, 2020b) (Figure 1).

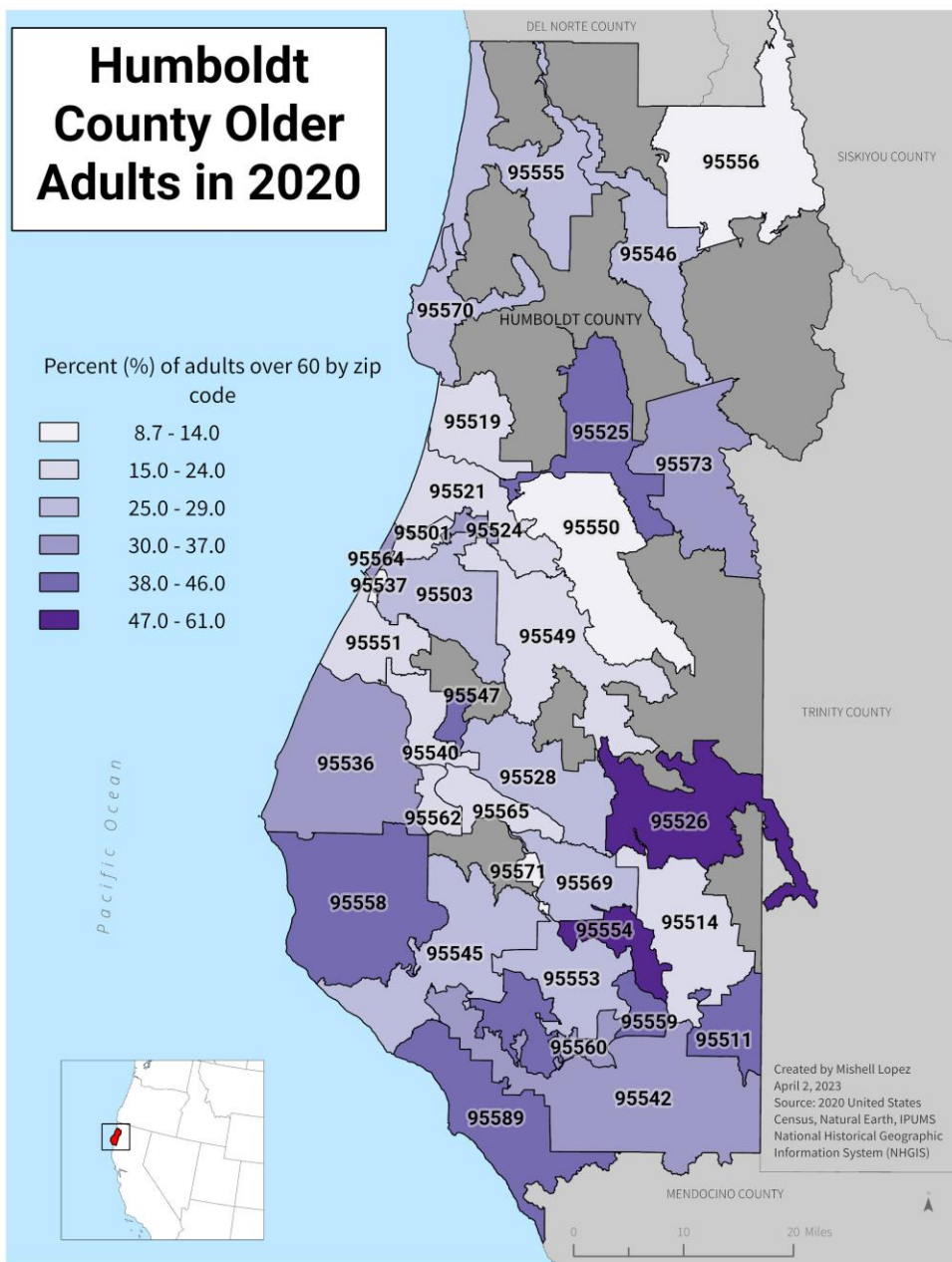


Figure 1. Humboldt County percentage of older adults aged 60 years and over by zip code. 2020 older adult and total population data were obtained from U.S. Census Bureau.

Del Norte County is 1,006.37 square miles and has about 28.4 people per square mile.

The total population of Del Norte County in 2020 was 27,745 (U.S. Census Bureau, 2020a) and the total older adult population was 6,907 (Figure 2).

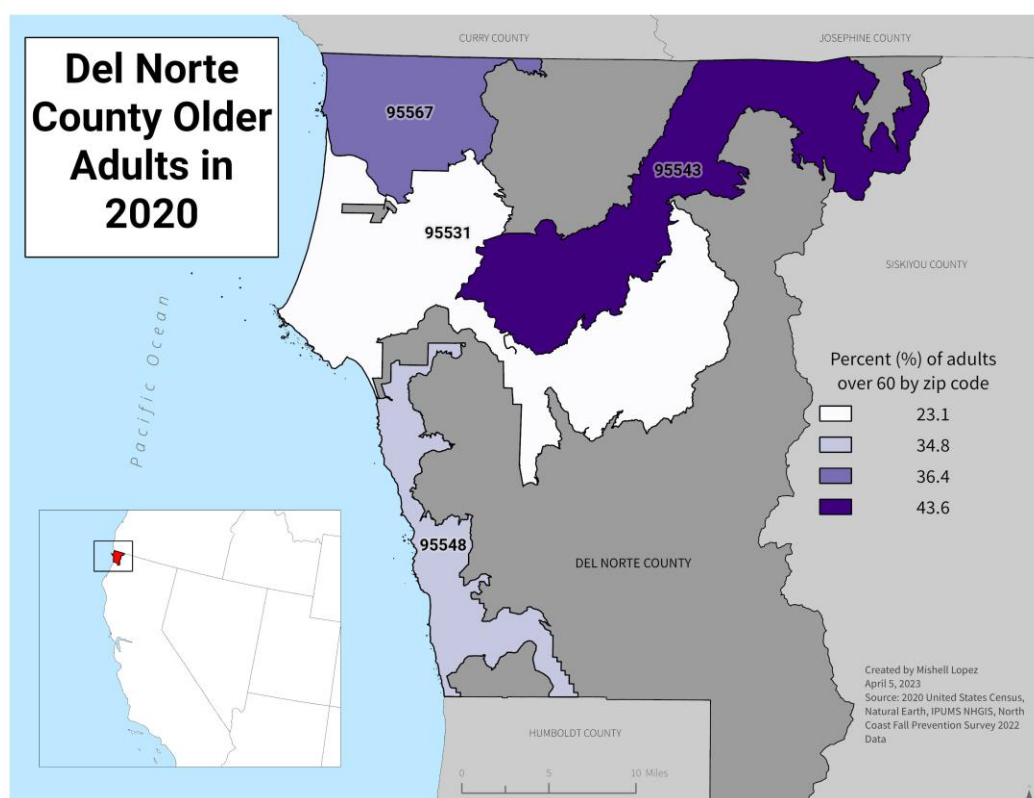


Figure 2. Del Norte County percentage of older adults aged 60 years and over by zip code. 2020 older adult and total population data were obtained from U.S. Census Bureau.

To achieve a sample of adults aged 60 years and over in Humboldt and Del Norte Counties with a confidence level of 95% and level of precision of .05, we used the Formula for Calculating a Sample for Proportions (N = population size and e = level of precision) (Table C1):

$$n = \frac{N}{1 + N(e^2)}$$

However, due to the small population size of each zip code we then adjusted for population for Humboldt (Table C2) and Del Norte (Table C3). The Finite Population Correction for Proportions adjusts for a small population (n = sample size, and N = population size) (Singh & Masuku, 2014):

$$n = n_0 / [1 + \frac{(n_0 - 1)}{N}]$$

Survey data was used only if participants resided in Humboldt and Del Norte Counties and were over the age of 60. All community dwelling and institutional residing residents were invited to join. Prior to data collection, the Institutional Review Board (IRB) approved this research (IRB 21-084). This study was granted an “exempt” status as the NCFP survey was anonymous and the information collected was recorded in a manner that the identity of the participants cannot readily be ascertained directly or through identifiers. The primary investigator did not contact the subjects, nor did they try to re-identify the subjects. The participants were provided with basic information regarding the risks and benefits of the study before completing the survey.

Experimental Design

After IRB approved the study, the NCFP survey was advertised to local agencies using public service announcements and fliers. The flier (Appendix A) contained a QR code to access the online version of the survey and a phone number to receive a paper version of the survey. Participants were able to access the survey in two ways: a paper copy of the survey or online via ArcGIS Survey123. The paper copy of the survey

contained: a cover letter, “anonymous exempt” informed consent, 57 questions, and a paid return envelope (Appendix B). All paper surveys received were entered manually into ArcGIS Survey 123. We anticipated collecting data for three months, beginning March 2022 to May 2022, however due to a low response from certain zip codes we extended the data collection for another four months. This resulted in data collection stopping in September 2022.

In September 2022, data was downloaded from ArcGIS Survey123 coded and organized using excel. The data was separated by Humboldt and Del Norte County, by zip codes and rural and urban designations. Humboldt has 35 zip codes and Del Norte 4 zip codes. If a zip code had a population less than 2,500 it was given a rural designation. If a zip code had more than 2,500 it was given an urban designation (U. S. Census, 2010). Descriptive analysis was conducted using SPSS. The data was further analyzed in SPSS by fallers and non-fallers. Result data table topics included, demographics, fall risk, fall history and circumstance. It also included intrinsic, behavioral, and extrinsic risk factors. Last, it included fall prevention and barriers.

To visually create maps, data was also organized for compatibility with ArcGIS Pro. TIGER/LINE shapefiles from the U.S. Census Bureau were downloaded of 2020 Counties, and Zip codes. County and State shapefiles were also downloaded from IPUMS National Historical Geographic Information System (NHGIS), and Natural Earth respectively. The following maps were produced for Humboldt and Del Norte Counties: percentage of sample size achieved for each zip code, older adult fallers, fall injuries, fall risk (screened using the Stay Independent 12-question tool), fall incidence rate, and

preferred fall prevention class. Except for the fall prevention classes, all maps contained graduated colors to visualize data.

Measurements

North Coast Fall Prevention (NCFP) Survey

The survey included questions on demographics, history of falls in the last 12 months, fall circumstance of a recent fall in the last 12 months, past medical history like chronic conditions, pain, and medication intake, fear of falling, physical, muscle strengthening, balance and flexibility activity. It also included environmental risk factors such as indoor and outdoor hazards, type of footwear worn, and fall prevention awareness, needs and barriers (Centers for Disease Control and Prevention, 2021b; Guirguis-Blake et al., 2018; American Geriatrics Society and British Geriatrics Society, 2011; Rubenstein et al., 2011).

To improve response rates, the NCFP survey contained a cover letter with a social utility appeal and was less than 2 pages (2-sided) (Houston & Nevin, 1977; Yammarino et al., 1991).

Statistical Analysis

The NCFP survey data underwent descriptive and GIS analysis. Statistical analysis was performed using SPSS software (SPSS Inc., 2019). Data was reported as mean, standard error of deviation, and percentages. ArcGIS Pro software was used to join (Esri, 2022) geographic features and data. Data was normalized using total survey

respondents or sample size per zip code. The incidence rate of falls was calculated per 100 older adults.

Assumptions

1. All participants were 60 years and older and resided in Humboldt or Del Norte Counties.
2. Participants answered the survey questions truthfully.
3. The sample of participants were proportionally representative of Humboldt County and Del Norte County.

Limitations

Some limitations that may exist include recall bias. Since the survey asked participants to recall past medical history, participant information may not be accurate. Additionally, not all fall risk factors were assessed in this survey due to concern that excessive survey length would severely reduce response rates. Non-response bias may also be present and there is a chance participants may have refused to complete the survey because they were too busy or did not think the survey was relevant. Self-selection bias, where individuals choose to participate in the study because they are interested in the topic may have occurred as well. Unfortunately, this survey was only available in English limiting certain groups from participating. Last, this study is only representative of Humboldt and Del Norte Counties.

Delimitations

This study was limited to adults 60 years and over in Humboldt County and Del Norte County. Thus, sample population is only representative of Humboldt and Del Norte counties and cannot be generalized to other counties in California. Since rural populations are small, the sampling was not randomized. Participants who have cognitive deficits may not have been included.

RESULTS

Advertising, Distribution and Data Collection of Del Norte and Humboldt Counties

Advertising

Prior to distribution the NCFP Survey was initially advertised at the end of January 2022 with a flier and public service announcements (Table C4). In Del Norte County, survey fliers were provided to 13 organizations to distribute to the seniors they serve. The fliers were also posted on three community boards (Table C5). In addition, four Del Norte County organizations (two newspapers and two radio stations) also assisted with public service announcements. In Humboldt County, the survey fliers were provided to 29 organizations for distribution. Public service announcements were provided to four organizations (three radio stations and one newspaper). Additionally, fliers were posted on 18 community boards.

Distribution

The NCFP Survey was distributed to participants electronically and physically. Specifically, an internet link to the online survey was included in all fliers and a phone number to request a paper copy of the survey. In the public service announcements, a phone number was listed to gather more information regarding the survey. The paper version of the NCFP Survey was distributed to participants using several methods including using mailing list of partner organizations, physical distribution by partner organizations to their clients, direct mailing in response to individual request and using U.S. postal Every Door Direct Mail® (EDDM®) service.

Starting in March 2022, we began to distribute paper copies of the NCFP survey using our community partner organizations. In Del Norte County we provided paper 261 copies of the NCFP to one organization (Table C6). In Humboldt County, we provided 83 paper copies of the NCFP survey to three organizations. We provided a total of 2,386 paper copies to three organizations serving Humboldt and Del Norte older adults. Moreover, in May 2022, US postal EDDM® service was used to identify mailing routes in both Humboldt and Del Norte Counties with an older adult population density of 60% or greater. This information was used to distribute 3,250 surveys via direct mail to targeted zip codes with limited response rates using prior methods.

Data collection

Data was collected between March 2022 to September 2022. The total number of paper surveys distributed in Humboldt and Del Norte Counties was 5,980. Seven hundred seventy-four surveys were returned on paper, and 28 surveys were completed online. Of these surveys, 762 participants were eligible for this study (age range of 60-98 years old), and 40 were excluded because they did not meet the age or location criteria. For Humboldt County we received the sample size needed to sufficiently represent the county population overall. However, in Del Norte County we only received 38.9% of its sample size.

Last, none of the 35 zip codes of Humboldt or the four zip codes of Del Norte received the sample size needed to represent its zip code population (Table C7 and Table C8). Del Norte County's zip code of 95531 received 27.1% of its sample size (Figure 3).

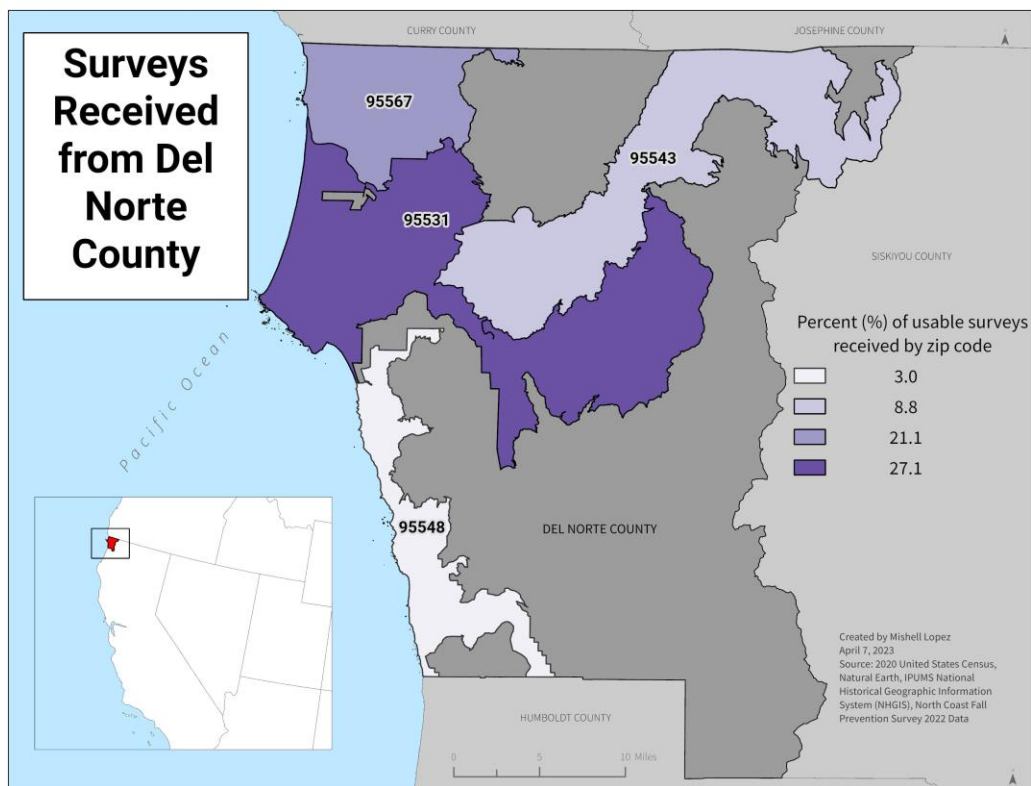


Figure 3. Percent of usable surveys received out of the calculated sample size of Del Norte County zip codes.

It was the highest sample size received per zip code in Del Norte County. Three areas in Humboldt County had the highest sample response (Figure 4).

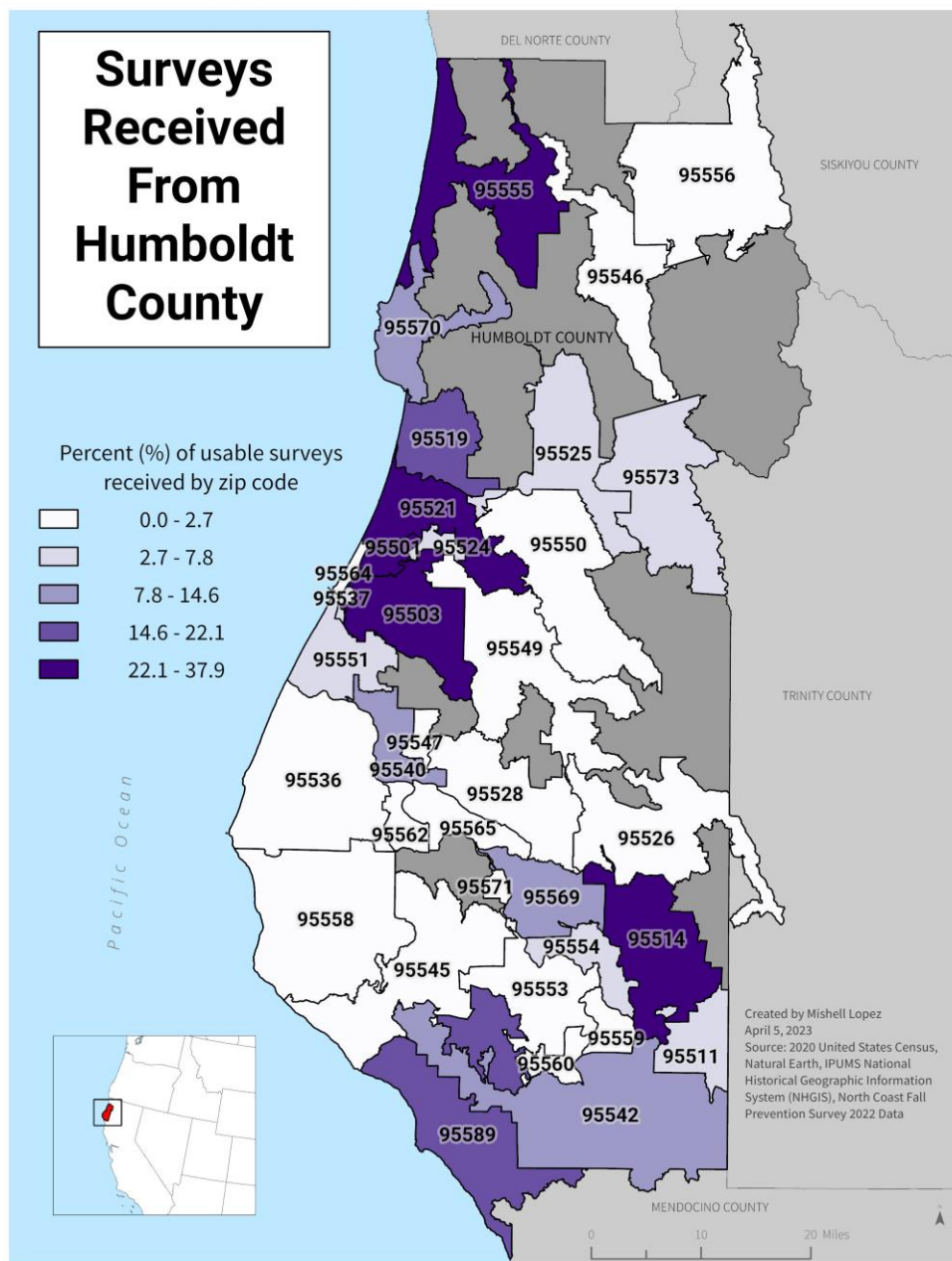


Figure 4. Percent of usable surveys received out of the calculated sample size of Humboldt County zip codes.

The first area, 95503 (Eureka), 95501 (Eureka), 95521 (Arcata) is where high urban clusters exist in the bay. The second area 95555 (Orick) is located at the northwest

portion of Humboldt, and the third area 95514 (Blocksburg) is in the outer southeast edge of Humboldt County. We received no data for eight out of the 35 zip codes in Humboldt County. We had a total of 27 Humboldt County zip codes with data. All four zip codes in Del Norte County received surveys.

Del Norte County's NCFP Survey Descriptive Data

Demographics: Intrinsic personal characteristics

Del Norte County had a total of 147 eligible surveys. Of those 147 surveys, 52 were from rural zip code communities (defined as less than 2,500 residents), and 95 were from urban zip code communities (defined as greater than 2,500 residents). Del Norte participants were 73.4 years ($SD = 7.6$), 61.9% female, and 96.7% non-Hispanic (Table C10). Regarding race, 76.1% self-identified as Caucasian, and 14.2% as American Indian. Rural Del Norte had an 8.1% higher prevalence of American Indian respondents than urban Del Norte. In addition, Del Norte County older adults reported some college as their highest level of education. In rural Del Norte, participants reported some college and an associate degree as their highest level of education.

Del Norte County residents were 46.3% married (Table C12), and 28.1% reported a yearly income for a household of two below the 2023 United States Federal Poverty Level (Department of Health and Human Services, 2023). Rural older adults reported earning over \$80,000, 12.4% more than urban older adults. Moreover, Del Norte, older adults, were community-dwelling and lived in a house (74.8%) or mobile home (15.6%).

Interestingly 14% of Del Norte participants were Veterans ($n = 21$), but only four were VA service connected.

Fall risk

This study used three screening tools to assess fall risk, including the Three Key Questions, MAHC-10, and Stay Independent: a 12-question tool. The composite scores for each of the three screening tools showed, on average, that 69% of Del Norte County seniors are at risk of falling (Table C14). However, the Stay Independent screening tool showed rural Del Norte participants were less at risk (48.1%) of falling than their urban counterparts (56.8%). Yet, rural Del Norte's average Stay Independent fall risk was a 4 ($SD = 2.6$). A score of 4 or more on Stay Independent indicates a risk of falling.

Fall history and circumstance of recent fall in the last 12 months

Del Norte County participants fell an average of 1.2 times in the last year ($SD = 2.6$). Of the 60 fallers, 86.7% reported an injury from one or more falls. Rural older adult fallers who reported an injury (Table C16) had a 13.1% greater prevalence of fall injuries than urban older adults. The top two reported injuries of a recent fall in the last year across Del Norte were bruises (number one reported injury) and cuts or abrasions (number two reported injury). Moreover, rural fallers had a 11.6% greater prevalence of cuts or abrasions than urban fallers. Other commonly reported injuries by Del Norte participants were sprain/ligaments (9.7%), broken bones and fractures (7.5%), other (6.5%), and traumatic brain injuries (4.3%). Del Norte respondents mostly did not seek assistance for their most recent fall, but those that did reported visiting the Emergency Room.

Del Norte's older adults' most recent fall happened outdoors (20.4%) and around their yards (13.3%) (Table C18). They fell forward (34.3%), and sideways (34.3%) and in the afternoon (43.4%). Their fall occurred because they tripped (24.2%) or lost their balance (19.2%) (Table C20) while walking on level (14.0%) or uneven ground (13.2%) (Table C22). Rural older adults reported they primarily fell sideways (36.4%) while urban older adults frequently reported falling forward (40.0%). Rural older adults reported tripping 19.3% more than urban fallers, and urban fallers reported losing their balance 7.6% more than rural fallers. Rural fallers frequently reported they were walking on level ground (17.6%), going down the stairs (11.8%), and walking on uneven ground (11.8%) when they fell. On the contrary, urban fallers frequently reported walking on uneven ground (13.8%), walking on level ground (12.5%), and standing (12.5%) when they fell.

Intrinsic medical risk factors

Del Norte County respondents had an average BMI of 28.2 ($SD = 7.0$) (Table C24) and reported a FOF (78.5%). Urban fallers had a 23.6% higher prevalence of FOF than urban non-fallers. More than half of Del Norte participants said they were restricting their activities because of FOF. Rural fallers had an 18.7% higher prevalence of activity restriction than rural non-fallers, and urban fallers had a 39.8% higher prevalence of activity restriction than non-fallers. Del Norte, older adults, indicated they never needed help with personal care (89.7%) or handling chores or errands (67.4%). However, rural fallers reported "Never" needing assistance with personal care 20.5% less than rural non-fallers and "Never" needing help handling chores 27.6% less than rural non-fallers.

Similarly, urban fallers reported “Never” needing assistance with personal care 9.8% less than urban non-fallers and “Never” needing help with handling chores or errands 16.2% less than urban non-fallers.

In Del Norte, 79.6% of participants reported having one or more chronic health conditions. Rural and urban fallers had a higher prevalence (15.7% and 10.4%, respectively) of one or more chronic conditions than rural and urban non-fallers. Del Norte’s older adults also frequently reported having arthritis or osteoarthritis (17.5%) followed by hypertension (12.9%) (Table C26) and commonly taking arthritis (17.1%) and hypertension medication (15.7%) (Table C28). Moreover, 88.1% of Del Norte respondents were prescribed drugs by their providers and, on average, prescribed 4.6 (*SD* = 3.9) medicines. In addition, urban fallers reported a higher average of prescribed medicines than urban non-fallers, and urban respondents reported taking more medications than rural Del Norte County (Table C30).

Throughout Del Norte County, 70.1% of older adults reported pain in the last 12 months that lasted three or more months (Table C32). They commonly reported pain located in their back (21.1%), hip (15.2%), and knee (14.9%). However, their pain location differed across urban and rural older adults. Rural non-fallers frequently reported back, hip, knee, and shoulders (55.6%, 50.0%, 27.8%, 27.8%, respectively), while rural fallers commonly indicated their pain location was on their hip, back, knee, and shoulders (57.1%, 57.1%, 42.9% and 35.7% respectively). Urban non-fallers indicated pain in their back, hip, knee, and shoulders (61.5%, 46.2%, 46.2%, and 35.9%, respectively), and urban fallers indicated pain in their back, knee, and shoulders (72.4%, 55.2%, 37.9%).

Due to the pain, 60% of Del Norte participants reported mobility restrictions. Urban fallers had a 17.8% higher prevalence of pain restriction than rural fallers. In addition, rural and urban Del Norte fallers had a higher majority of pain restriction (23.8% and 13.5%, respectively) than rural and urban non-fallers. Relatedly, urban adults had a 22.4% higher prevalence of consuming pain medication than rural older adults, and rural and urban fallers reported taking 13.5% and 21.6% more (respectively) than rural and urban non-fallers.

More than half of Del Norte respondents indicated they had functional limitations, and fallers specified more functional limitations than non-fallers (Table C34). Urban and rural fallers had a higher prevalence of walking (21.9% and 24.4% respectively) and balance (21.0% and 24.4% respectively) instability than non-fallers. Moreover, Del Norte rural fallers showed a 26.1% higher prevalence of needing assistance to get up from a chair than rural non-fallers and had a 7.7% higher occurrence than urban fallers.

Although fallers in both rural and urban designations displayed higher percentages of needing devices and general assistance with mobility, Del Norte older adults expressed they were able to walk up and down stairs without assistance and did not need mobility assistance. Moreover, rural residents indicated they were more able to perform these activities than the rest of the participants, even though they showed they had more functional limitations than the rest of Del Norte County.

Behavioral risk factors.

More than half of Del Norte participants (69.4%) engaged in physical activity (Table C36), but less than half of them performed muscle-strengthening movements

(46.2%). Moreover, rural fallers showed a 24.3% higher prevalence of physical inactivity than rural non-fallers and had the highest percentage of inactivity (47.6%) compared to the rest of Del Norte. Additionally, rural, and urban fallers demonstrated a higher pervasiveness of muscle-strengthening inaction than non-fallers (31.4% and 14.1% respectively). Rural fallers had the highest percentage of muscle inactivity (71.4%) than the rest of Del Norte. In addition, 58.3% of Del Norte respondents did not participate in a balance, flexibility, or local class. Rural fallers and non-fallers reported the highest percentage of non-attendance (66.7%) than their urban counterparts.

Extrinsic risk factors

Del Norte's frequent home hazards (Table C38) included throw rugs (15.9%), front entrance edge (13.5%), pets around feet (12.9%), bathtub or shower without grab bars (12.7%), and bathtub or shower edge (12.2%). Rural non-fallers commonly reported pets (59.1%) and throw rugs (54.5%) while rural fallers frequently showed they had front entrance edges (75.0%) and throw rugs (65.2%). Urban non-fallers and fallers often showed throw rugs were their number one home hazard identified followed by front entrance edges. For outdoor home hazards (Table C40), rural non-fallers reported pets near their feet (40.0%), slippery walkways or steps (35.0%), and uneven surfaces (35.0%). Outdoor hazards frequently chosen by rural fallers were poor or no lighting (36.4%), pets near feet (27.3%), items on walkways (27.3%), and slippery walkways or steps (27.3%). Additionally, urban non-fallers chose pets near their feet (47.6%) and uneven surfaces (33.3%), while urban fallers picked uneven surfaces (35.7%) and pets near their feet (32.1%) frequently.

Different types of footwear such as slippers, walking barefoot, and wearing socks without shoes can increase the risk of falling. For rural non-fallers, slippers (Table C42) were the second most frequently reported footwear along with thick soles shoes. They also displayed a 25.7% higher prevalence of slipper usage than rural fallers. Rural fallers reported 23.8% wore socks without shoes along with other types of footwear. Urban non-fallers and fallers' third most reported footwear were slippers (41.5% and 28.2% respectively).

Fall prevention

Although less than half of Del Norte respondents' medication have not been reviewed for fall risk, 100% of all older adults reported they were aware of the medication prescribed to them (Table C44). A high percentage of Del Norte older adults indicated they have never had their home inspected for falls (88.9%), but only 47.2% were "maybe", "likely", or "very willing" to pay for home modifications to reduce injury.

Across Del Norte, 86.4% of older adults perceived there was a "low", "moderate", or "high" chance they would fall in the next 12 months. Rural older adults had a 6.1% higher prevalence of perceiving they would fall compared to urban fallers, yet they indicated 56.1% that they did not want to receive fall prevention (Table C46). On the contrary, 66.3% of urban participants indicated willingness to receive fall prevention. Across Del Norte, the top methods requested for receiving information were through the internet (27.7%) and a private conversation with a doctor (23.9%).

Older adults were asked what fall prevention classes interested them if offered for free and rural older adults frequently chose Tai Chi (25.2%), while Urban adults chose

SAIL (21.4%). Finally, although Del Norte respondents commonly reported no barriers to receiving or accessing care, rural and urban older adults agreed their distance or geographic location to health care was an issue (Table C48).

Del Norte County's visual analysis of the NCFP Survey by zip codes

Two of the four Del Norte zip codes (Gasquet, CA, 95543 and Crescent City, CA, 95531) received Stay Independent screening scores higher than four (Figure 5).

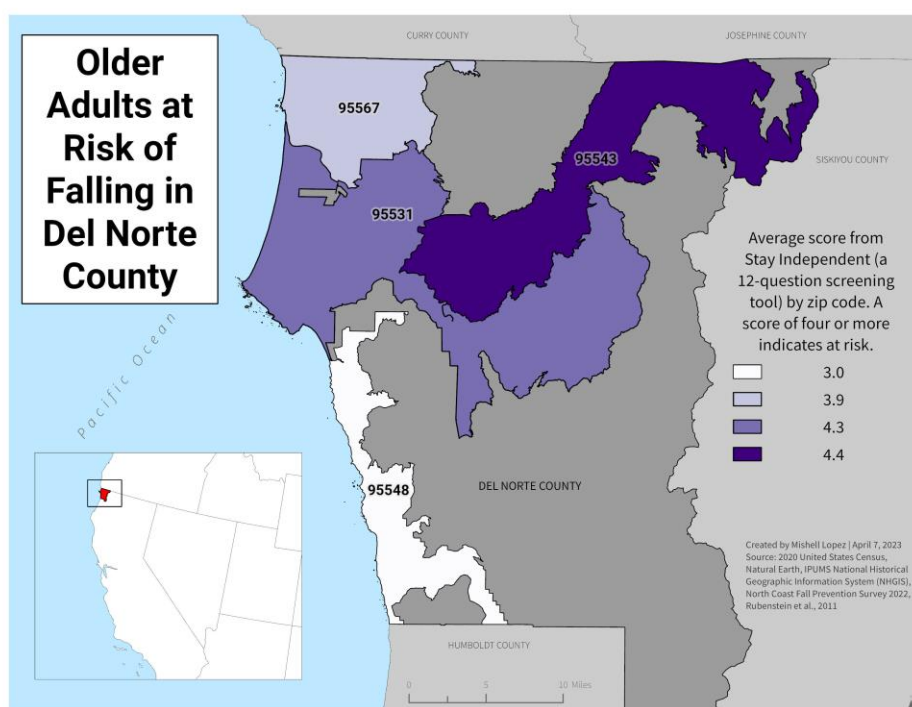


Figure 5. Older adults at risk of falling in Del Norte County by zip code. At risk scores were calculated using the Stay Independent, a 12-question screening tool.

In Del Norte County, Gasquet, CA, 95543 had the highest percentage of fallers per zip code (55.6%). It was the only zip code out of Del Norte County with more than 50% of respondents with fallers (Figure 6).

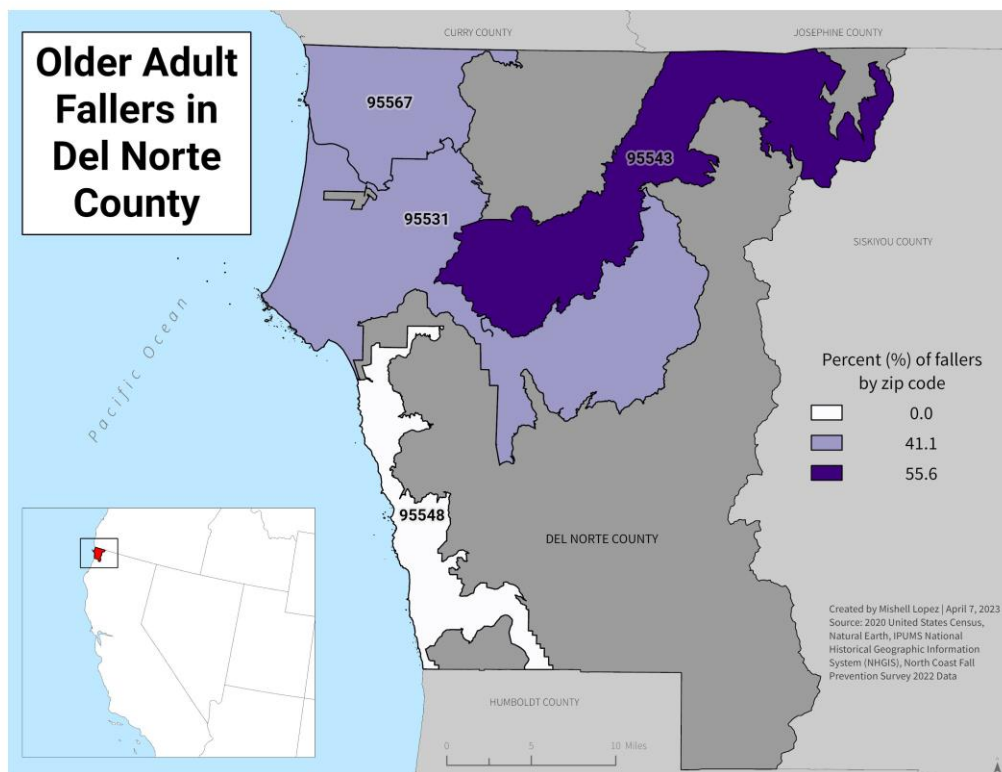


Figure 6. Older adult fallers in Del Norte County by zip code. Percent calculated by dividing fallers per zip code by respondents per zip code.

Yet, three zip codes had a high percentage of fallers who reported fall injuries (Gasquet CA, 95543, Smith River, CA, 95567 and Crescent City CA, 95531). Gasquet CA, 95543 had 100% of their fallers report an injury (Figure 7).

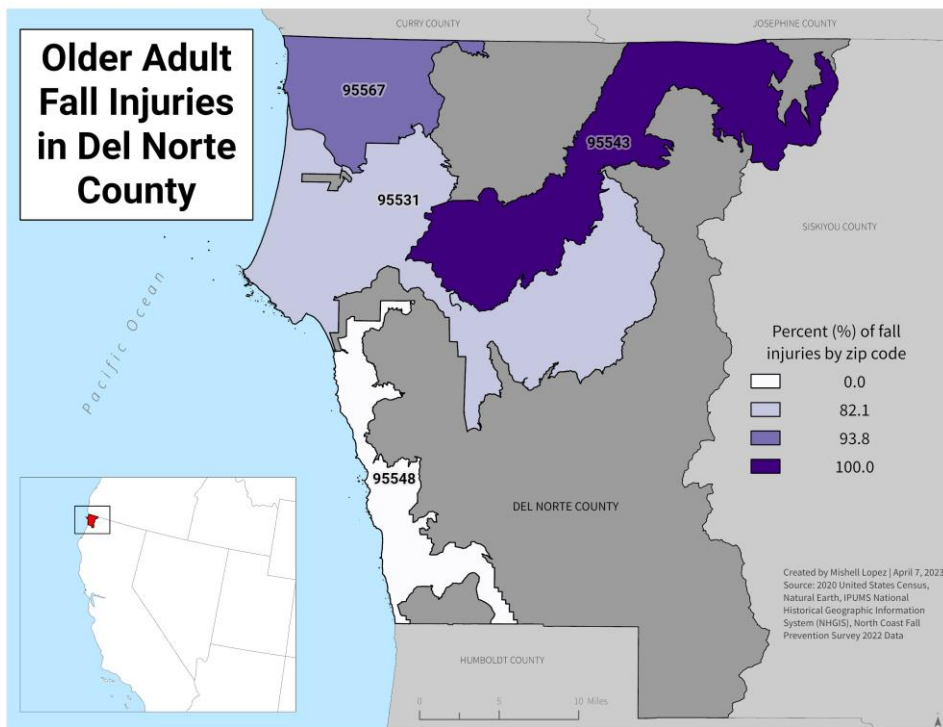


Figure 7. Older adults fall injuries in Del Norte County by zip code. Percent of fall injuries calculated by dividing fall injuries per zip code by fallers by zip code.

Two zip codes had an incidence rate higher than 100 cases of falls per 100 older adults

(Figure 8).

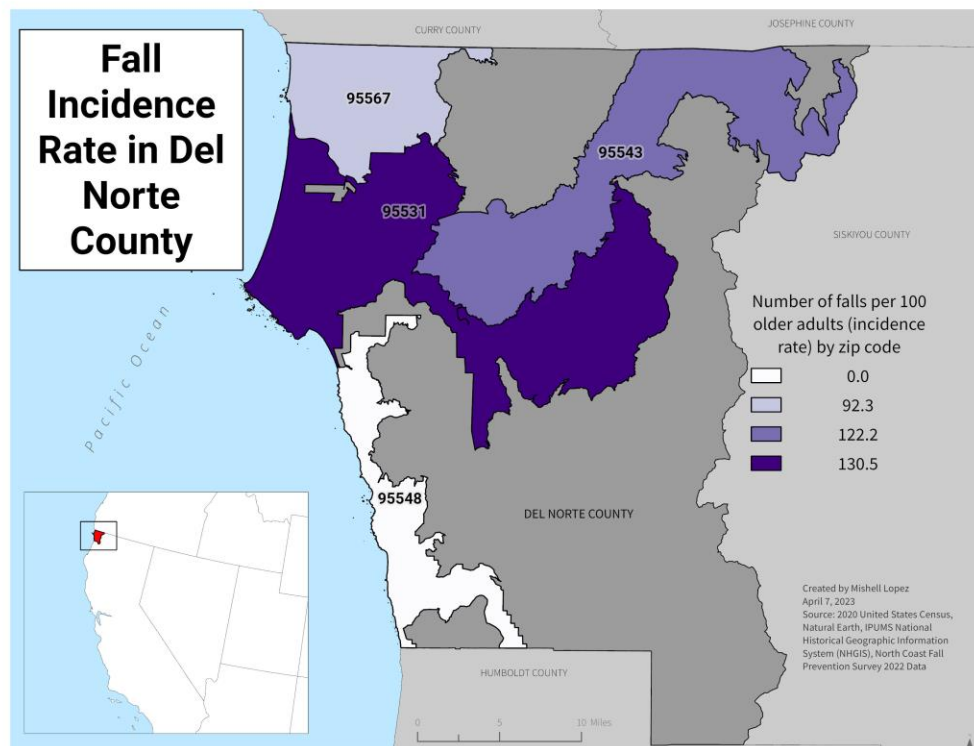


Figure 8. Del Norte County fall incidence rate per 100 older adults by zip code.

Zip code 95531 had an incidence rate of 122.2 cases of falls per 100 older adults. Zip code 95543 had an incidence rate of 130.5 cases of falls per 100 older adults. Crescent City, CA, 95531 covers the northwest coast of Del Norte County and ends approximately 5 miles from Del Norte's eastern border to Siskiyou County. Gasquet CA, 95543 is north of 95531 and covers rural northeast Del Norte County.

In Del Norte County, three zip codes (Klamath CA, 95548, Gasquet, CA 95543, and Crescent City, CA 95531) showed more than 86.3% of respondents did not have a fall risk assessment in the last 12 months. In Gasquet, CA, 95543, 100% of its respondents reported no fall risk assessment within the last 12 months (Figure 9).

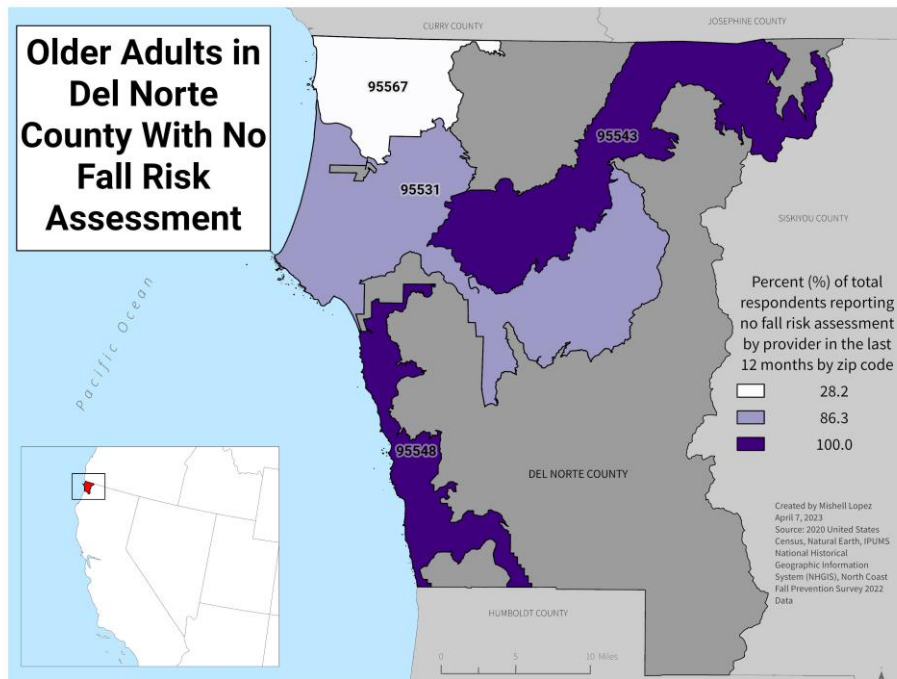


Figure 9. Older adults with no fall risk assessment in the last 12 months in Del Norte County by zip code. Percent calculated by dividing total respondents who reported no fall risk assessment per zip code by total respondents by zip code.

Furthermore, participants primary choice of fall prevention class resulted in three different options. Tai Chi was requested by Zip codes 95567 and 95548, SAIL was requested by urban zip code 95531, and a combination of Tai Chi and Sail was requested by 95543 (Figure 10).

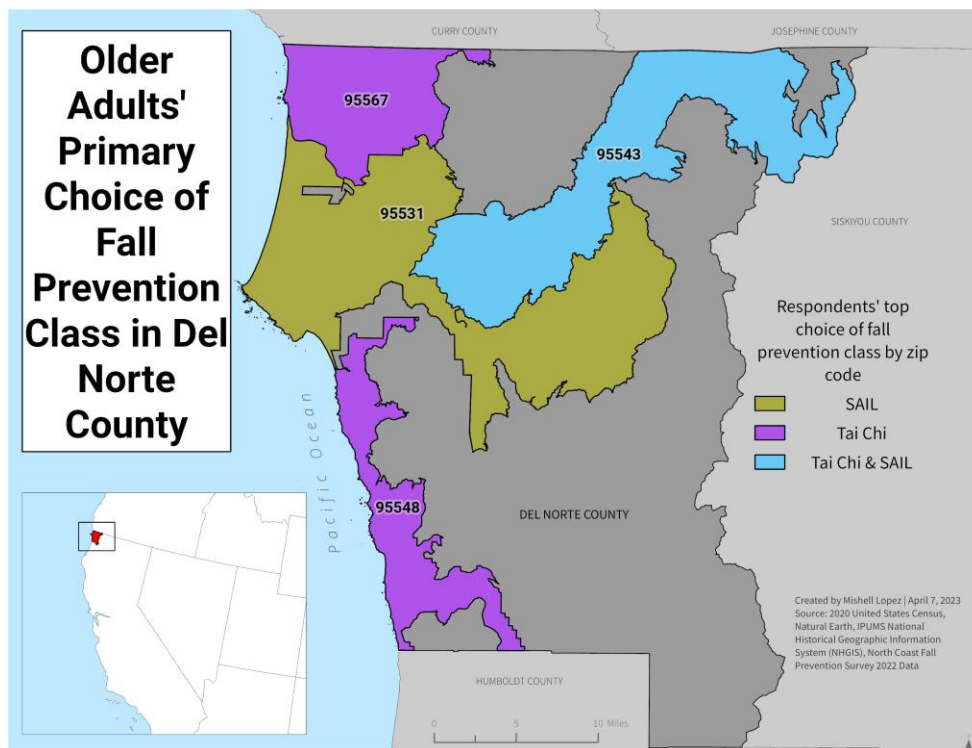


Figure 10. Older adults' primary choice of fall prevention class in Del Norte County by zip code. Stay Active and Independent for Life (SAIL) was the top choice for Crescent City, CA 95531. Tai Chi was the top choice for Smith River, CA 95567 and Klamath, CA 95548. Last, Gasquet, CA 95543 choice was Tai Chi and SAIL.

Humboldt County's NCFP Survey Descriptive Data

Demographics: Intrinsic personal characteristics

Humboldt County had a total of 615 eligible surveys (Table C9). Of those surveyed, 130 were from rural zip-code communities, and 485 were from urban zip-code communities. Humboldt County participants were, on average, 74 years old ($SD = 7.5$), non-Hispanic (98.1%), Caucasian (91.5%), American Indian (3.6%), and highly educated

(60.6%). Urban Humboldt County older adults had a 10.1% higher prevalence of bachelor's, graduate, or professional degrees than rural respondents.

Additionally, Humboldt County respondents were community-dwelling older adults (Table C11) who primarily lived in a house (90.8%) and were married (42.2%) or widowed (22.4%). Rural residents reported a 9.0% higher prevalence of yearly income below the federal income level than urban residents. Urban residents often (23.6%) disclosed (23.6%) an annual income greater than \$80,000 annually. About 10.0% of Humboldt County residents were Veterans, but only 12 indicated they were VA service connected.

Fall risk

The composite scores for each of the three screening tools showed, on average, that 67.4% of Humboldt County seniors are at risk of falling (Table C13). Moreover, urban residents had a higher risk of falling for each screening tool than rural residents. For example, the MAHC-10 and Stay Independent fall risk assessment tools showed rural residents were 10.0% and 8.2% (respectively) less at risk than urban residents.

Fall history and circumstance of recent fall in the last 12 months

Humboldt County participants fell an average of 1.4 times ($SD = 6.0$) in the last year (Table C15). Of the 295 fallers who reported a fall (48.0%), 292 answered the question on whether they were injured by one or more falls in the past year and 69.5% responded yes. Rural residents fell 7.4% more than urban fallers, but urban fallers were injured 5.0% more than rural respondents. The top two reported injuries of a recent fall in the last year across Humboldt County were bruises (number one reported injury) and cuts

or abrasions (number two reported injury). Humboldt County rural fallers stated they received physical therapy for their injuries while urban fallers visited their doctor. Overall, 61.9% of Humboldt County respondents did not utilize medical services after their fall.

Humboldt County's most recent fall in the last 12 months happened outdoors (26.3%) because of tripping (26.3%) or losing their balance (21.8%) (Table C17 and 19). Rural older adults frequently reporting falling outside 11.8% more than urban fallers. Additionally, rural fallers reported falling most during the afternoon (62.5%) and sideways (39.5%) whereas urban fallers reported falling most in the afternoon (54.8%) and forward (37.6%). Prior to the fall, rural fallers frequently said they were walking on uneven ground (21.9%), walking on level ground (12.4%) or rushing and hurrying (12.4%) (Table C21).

Intrinsic medical risk factors

Humboldt County respondents had an average BMI of 27.0 ($SD = 7.6$) (Table C23) and reported a FOF (74.4%). Urban fallers had a 13.9% higher prevalence of FOF than urban non-fallers and rural fallers had a 16.9% higher prevalence of FOF than rural non-fallers. More than half of Humboldt County participants said they were restricting their activities because of FOF. Rural fallers had a 13.1% higher prevalence of activity restriction than rural non-fallers, and urban fallers had a 17.3% higher prevalence of activity restriction than non-fallers. Humboldt older adults indicated they never needed help with personal care (90.5%) or handling chores or errands (69.8%). However, rural fallers reported never needing assistance with personal care 12.8% less than rural non-

fallers and never needing help handling chores 22.7% less than rural non-fallers.

Similarly, urban fallers reported never needing assistance with personal care 11.0% less than urban non-fallers and never needing help with handling chores or errands 13.8% less than urban non-fallers.

In Humboldt, 78.1% of participants reported having one or more chronic health conditions. Rural fallers had an 8.1% higher prevalence of one or more chronic conditions than rural non-fallers. Of the 19 chronic conditions listed, respondents frequently reported having arthritis or osteoarthritis (17.0%) followed by hypertension (12.9%) (Table C25) and commonly took hypertension (15.9%) and arthritis medication (15.7%) (Table C27). Moreover, 84.3% of Humboldt respondents were prescribed drugs by their providers and, on average, prescribed 4.0 ($SD = 2.8$) medicines. In addition, urban fallers reported a higher average of prescribed medicines than the rest of Humboldt County (Table C29). In general, fallers reported taking more sleep and mood enhancing medications than urban fallers.

Throughout Humboldt County, 66.0% of older adults reported pain in the last 12 months that lasted three or more months (Table C31). They commonly reported pain in their back (18.7%), hip (14.9%), and knee (14.9%). However, their pain location differed across urban and rural older adults. Rural non-fallers frequently reported knee (51.7%) and back (48.3%), while rural fallers commonly indicated their pain location was on their hip, back, and knee, (45.8%, 43.8%, and 43.8% respectively). Urban non-fallers indicated pain in their back (48.8%), and hip (39.6%) and urban fallers indicated pain in their back (51.6%), and knee (39.6%). Due to the pain, 57.8% of Humboldt participants reported

mobility restrictions. Urban fallers had a 7.2% higher prevalence of pain restriction than urban non-fallers and rural fallers had a 21.9% higher prevalence of restriction than non-fallers. Urban fallers were 9.7% more likely to report taking pain medication compared to urban non-fallers. On the contrary, rural non-fallers reported a 20.3% higher prevalence of pain medication intake than rural fallers.

Humboldt County fallers displayed higher levels of functional limitations than non-fallers across urban and rural locations (Table C33). Urban and rural fallers had a higher prevalence of walking instability (18.2% and 26.0% respectively), balance unsteadiness (15.9% and 20.8% respectively) and needing assistance getting up from a chair (21.2% and 15.1%). Despite the balance, mobility and strength instability, Humboldt County participants stated they were always able to bend, stoop, or kneel (65%), and walk up and down the stairs without assistance (83.9%). Also, more than half of Humboldt County respondents (69.4%) indicated they did not need assistive devices or any other forms of assistance for mobility.

Behavioral risk factors

In Humboldt County, 77.8% of older adults were physically active (Table C35). Urban non-fallers were 11.6% more likely to be physically active than urban fallers. In general, Humboldt County respondents participated in muscle strengthening activity (62.6%) and were active in balance, flexibility, or a local exercise class (63.4%). Urban non-fallers were 11.2% more likely than urban fallers to report muscle strengthening activity and 9.5% less likely to say they did not participate in a balance, flexibility, or local class.

Extrinsic risk factors

The most reported indoor hazards (Table C37) in Humboldt County were throw rugs (15.3%), front entrance edges (15.3%), and bathtub or shower without grab bars (13.2%). Similarly, rural non-fallers frequently listed bathtub or shower area without grab bars (58.8%) and front entrance edges (52.9%). Rural fallers listed bathtub or shower area (65.1%) without grab bars, front entrance edges (54.0%) and throw rugs (54.0%). Urban non-fallers frequently reported throw rugs (57.8%) and front entrance edges (56.5%) while urban fallers reported throw rugs (55.6%), front entrance edges (55.6%) and bathtub or shower edges without grab bars (44.9%).

The outdoor home hazards across rural and urban areas varied (Table C39). For example, rural non-fallers commonly stated uneven surfaces (54.5%) and no stair railing (36.4%) were present at their homes while rural fallers reported uneven surfaces (60.7%), slippery walkways or steps (41.0%) and pets near their feet (41.0%). Urban non-fallers and fallers frequently documented uneven surfaces (36.4% and 50.0% respectively) and pets near feet (27.8% and 35.2%) as outdoor hazards.

The two most reported footwear (Table C41) by Humboldt County were shoes with thin soles less than one inch (29.0%) and shoes with thick soles greater than one inch (25.1%). Urban and rural non-fallers were more likely to report walking barefoot and wearing socks without shoes, while urban and rural fallers reported more frequently wearing slippers than non-fallers.

Fall prevention

Although 63.7% of Humboldt County respondents' medication have not been reviewed by their doctor or pharmacists for fall risk, 98.2% of all older adults reported they were aware of the medication prescribed to them (Table C43). Moreover, 85.7% of Humboldt County older adults indicated they have never had their home inspected for falls. Urban respondents indicated they are 13.5% more willing than rural participants to pay for modifications to reduce injury.

Across Humboldt County, 89.0% of older adults perceived a likelihood of falling in the next 12 months, yet only 16.4% of respondents have been assessed by their provider for their risk of falling. Fortunately, 64.2% of participants were willing to receive fall prevention (Table C45). Urban participants were 10.0% more willing for fall prevention than rural older adults. Both rural and urban older adults agreed their preferred method of receiving information was through the internet (28.1%) and private conversation with a provider (21.9%).

Older adults were asked what fall prevention classes interested them if offered for free and rural and urban frequently chose Tai Chi. Rural respondents indicated their distance or geographic location of resources (37.8%) was a barrier to receiving or accessing care (Table C47). On the other hand, urban respondents stated there were no barriers (33.4%) and indicated "other" as the second most common barrier (11.0%).

Humboldt County's visual analysis of the NCFP survey by zip codes

Out of the 18 zip codes with mappable data, The Stay Independent fall risk screening tool revealed nine zip codes with older adults at risk of falling (95589, 95501,

95519, 95540, 95521, 95503, 95569, 95555, and 95554). Zip code 95554 (Myers Flat, CA) is in the southeast rural area of Humboldt County and scored 5.4 (Figure 11).

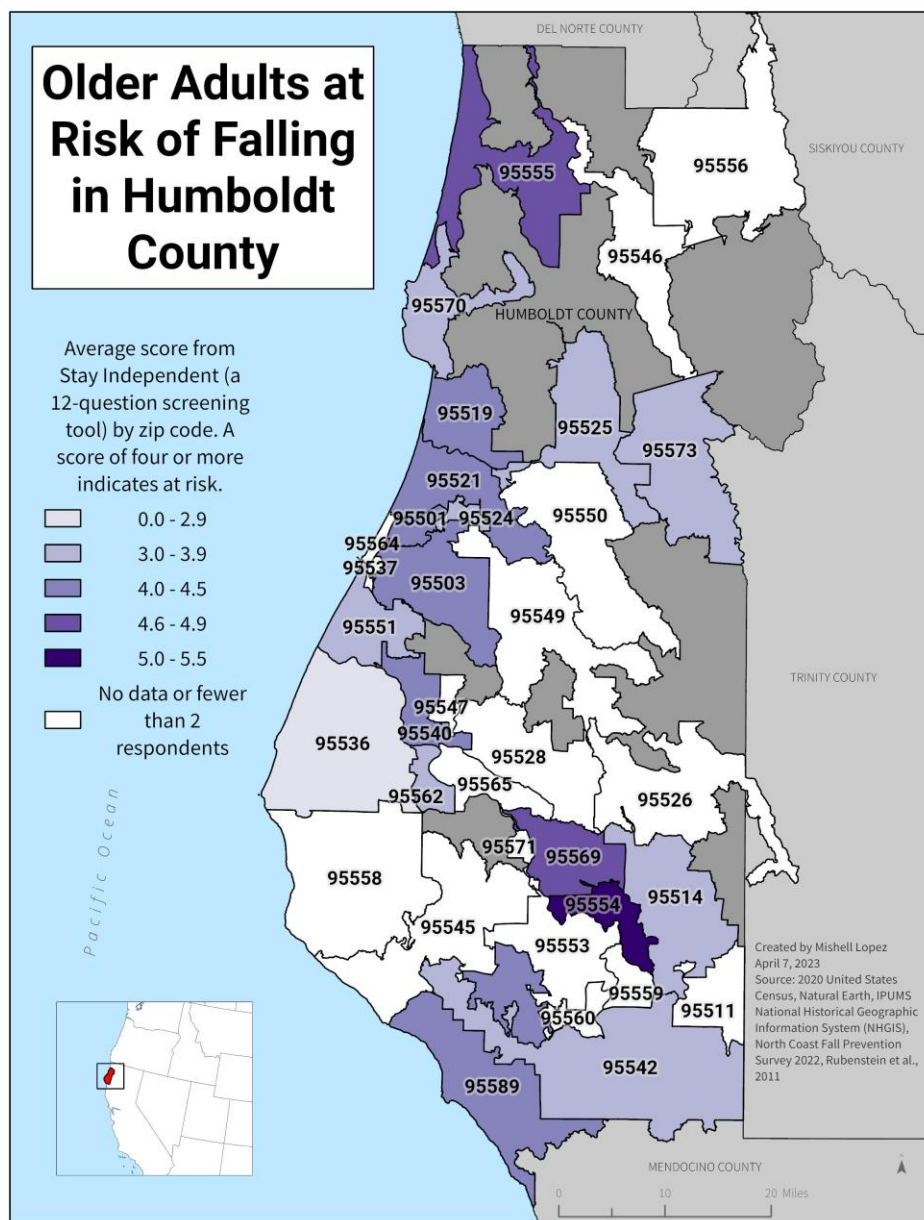


Figure 11. Older adults at risk of falling in Humboldt County. At risk scores were calculated using the Stay Independent, a 12-question screening tool.

The second and third highest fall risk scores were in rural Orick CA, 95555 (4.8) northwest of Humboldt County, and Red Crest, CA, 95569 (4.7) southeast beneath 95554 of Humboldt. If zip codes had fewer than two respondents, no data was visualized.

There were 9 zip codes where 50% or more of the respondents were fallers. Three zip codes had over 60% of their respondents who reported a fall: Redcrest, CA, 95569, Myers Flat, CA, 95554 and Blocksburg, CA 95514. These three zip codes are towards the southeast side of Humboldt County and share a border (Figure 12).

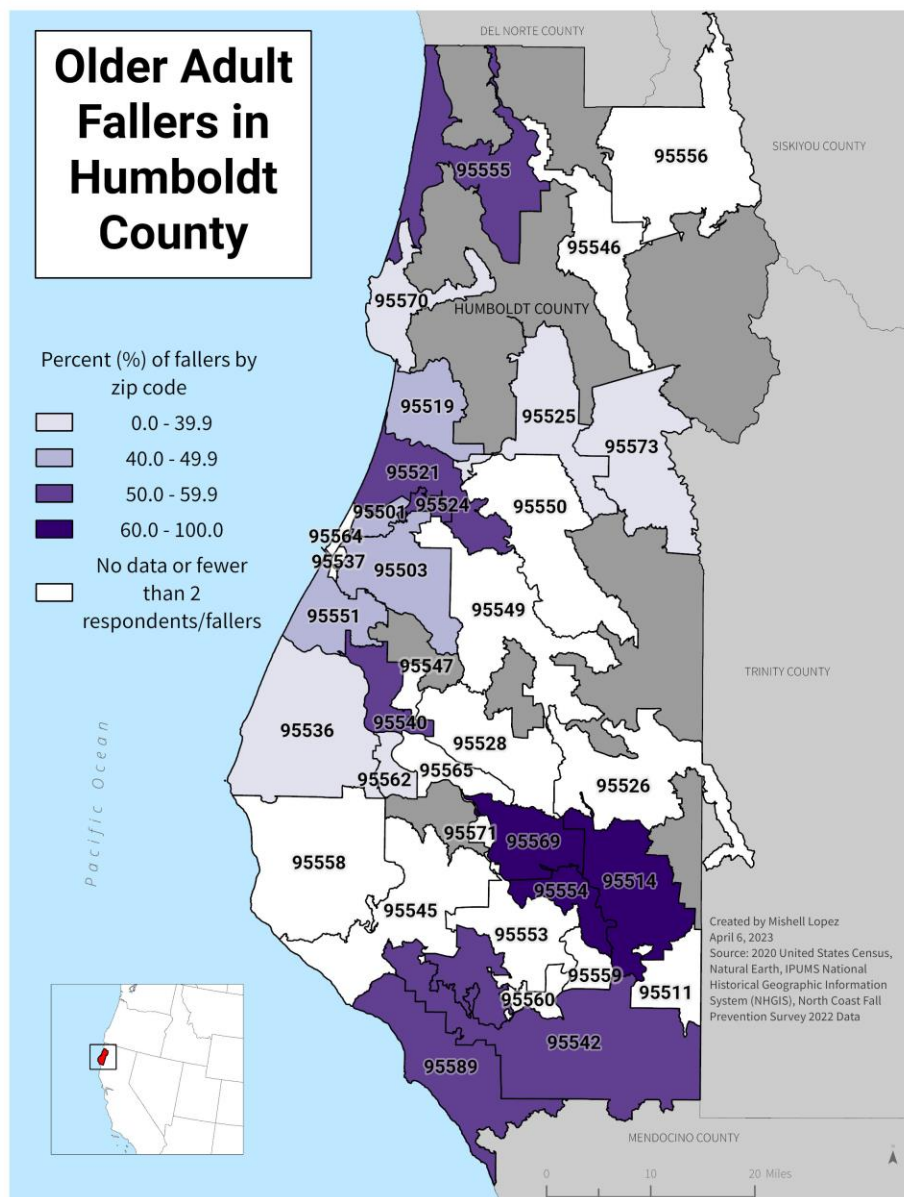


Figure 12. Older adult fallers in Humboldt County by zip code. Percent calculated by dividing fallers per zip code by respondents per zip code.

Moreover, 14 zip codes had 50% of their fallers report fall injuries (Figure 13).

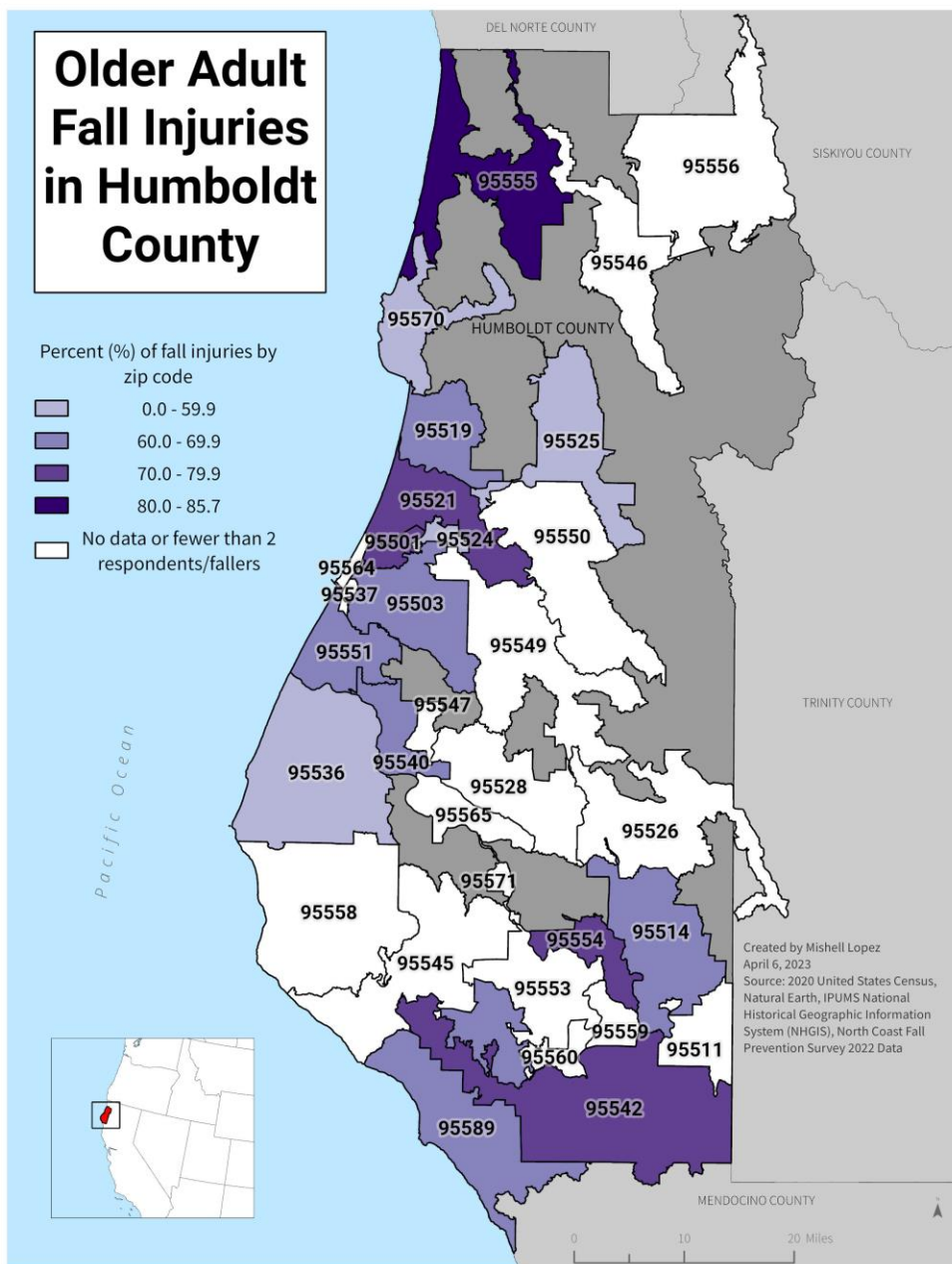


Figure 13. Older adults fall injuries in Humboldt County by zip code. Percent of fall injuries calculated by dividing fall injuries per zip code by fallers by zip code.

There were 11 zip codes with 60% of fallers who reported an injury (95540, 95589, 95514, 95551, 95519, 95503, 95542, 95521, 95554, 95501, 95555). Orick CA, 95555, located in Humboldt County's most northwest location had the highest percentage of fallers who reported a fall (85.7%). Two zip codes had incidence rates higher than 361 (95525 and 95542). Zip code 95525 (Blue Lake, CA) had an incidence rate of 769.2 cases of falls per 100 older adults and 95542 (Garberville, CA) had an incidence rate of 588.5 cases of falls per 100 older adults. Zip code 95525 is approximately 20 miles from the center of Humboldt County, and 95542 is at the southeastern bottom of Humboldt County (Figure 14).

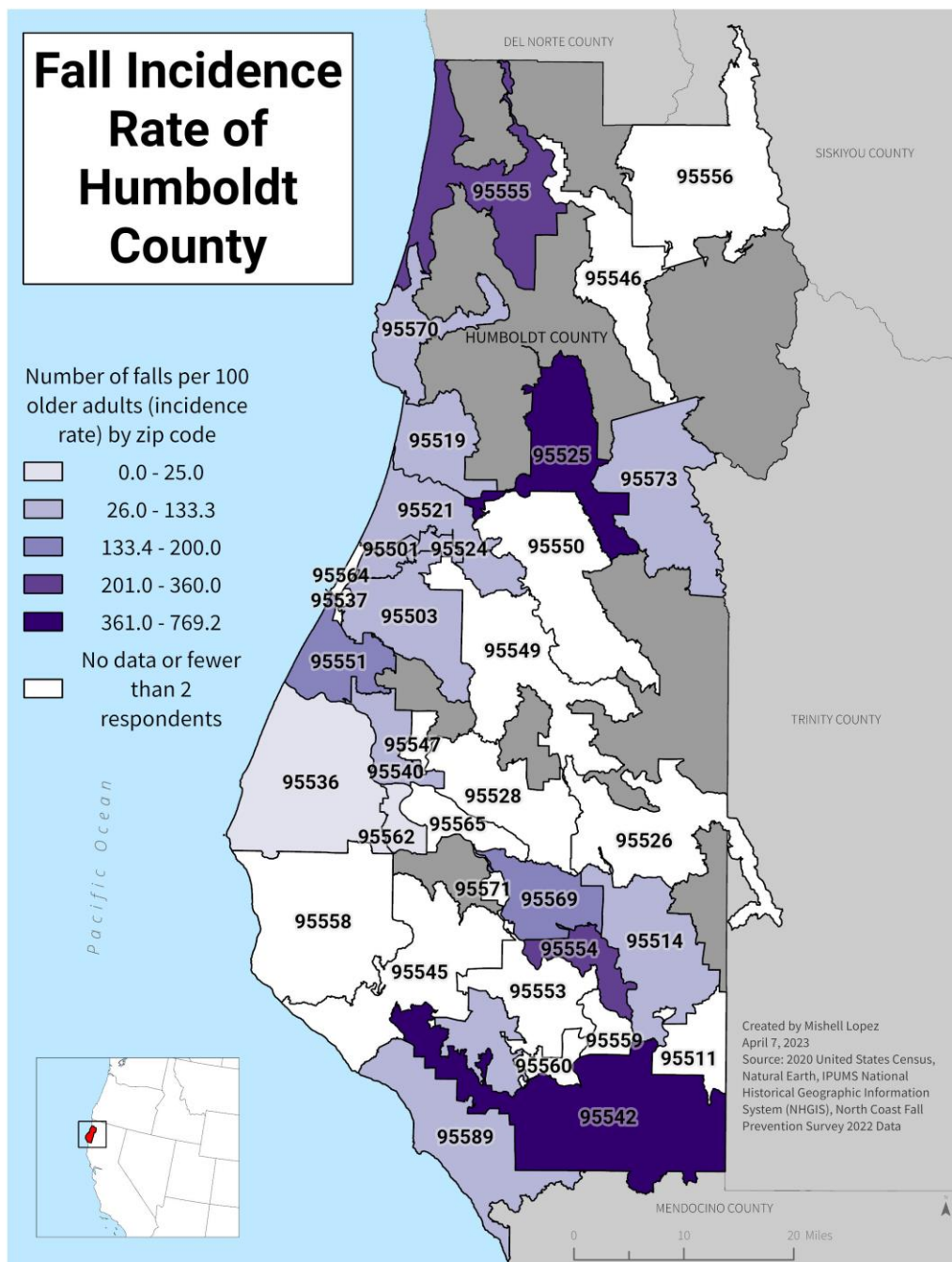


Figure 14. Del Norte County fall incidence rate per 100 older adults by zip code.

More than 60% of older adults reported no fall risk assessment in the last 12 months in the following 17 zip codes: 95569, 95551, 95536, 95555, 95540, 95570, 95519, 95503, 95501, 95521, 95525, 95542, 95589, 95514, 95524, 95554, 95573. Unfortunately, seven of these zip codes had more than 90% of older adults report no fall risk assessment in the last 12 months. These zip codes are Blue Lake, CA 95525, Garberville, CA 95542, Whitethorn, CA 95589, Blocksburg, CA 95514, Bayside, CA 95524, Myers Flat, CA 95554, and Willow Creek, CA 95573. Four of these zip codes are in the southern region of Humboldt (95589, 95542, 95514, and 95554), one (95524) is located nearer the western urban parts of Humboldt County about 5 miles above the center of Humboldt County, and two (95525, 95573) are located east of 95524 (Figure 15).

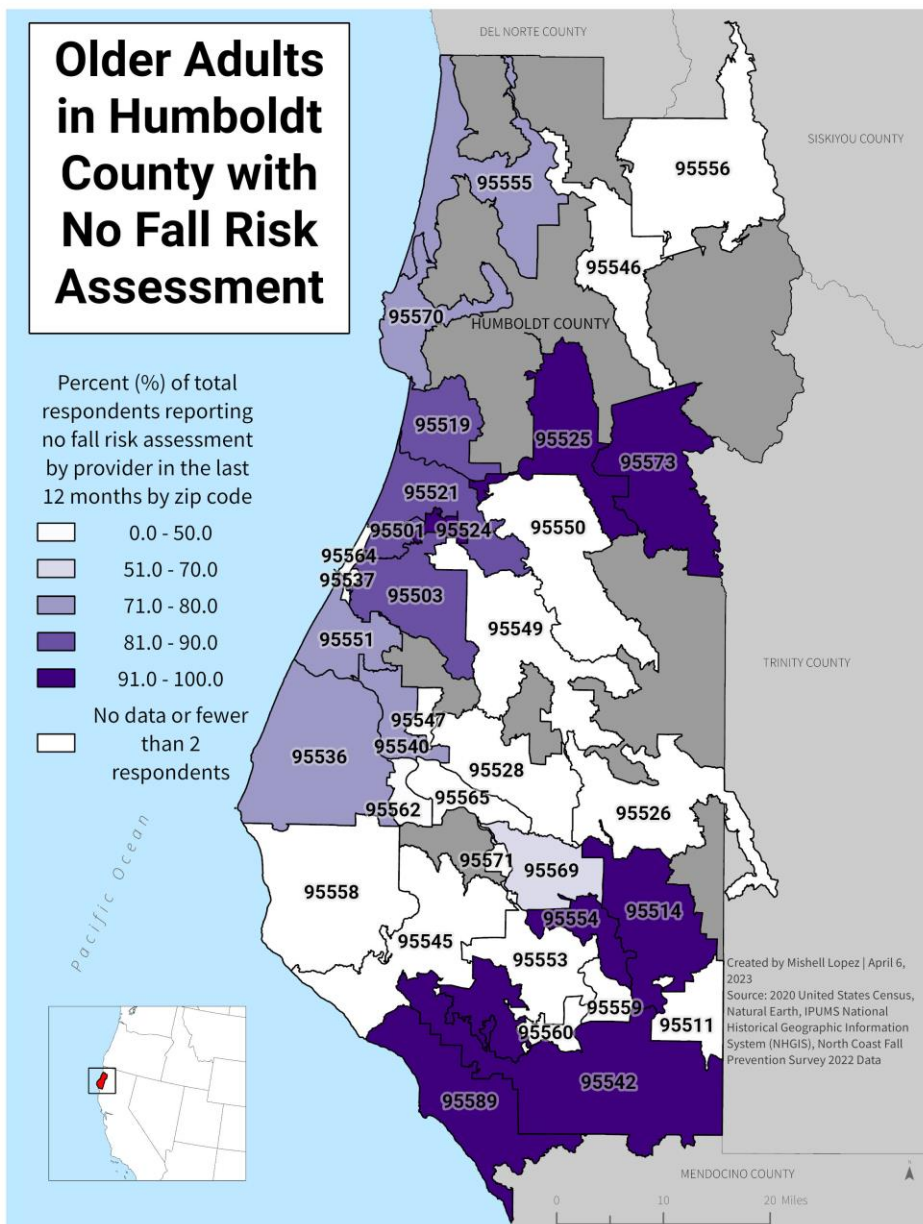


Figure 15. Older adults with no fall risk assessment in the last 12 months in Humboldt County by zip code. Percent calculated by dividing total respondents who reported no fall risk assessment per zip code by total respondents by zip code.

Finally, a closer look at older adults’ primary choice of fall prevention class revealed a variety of different choices (Figure 16).

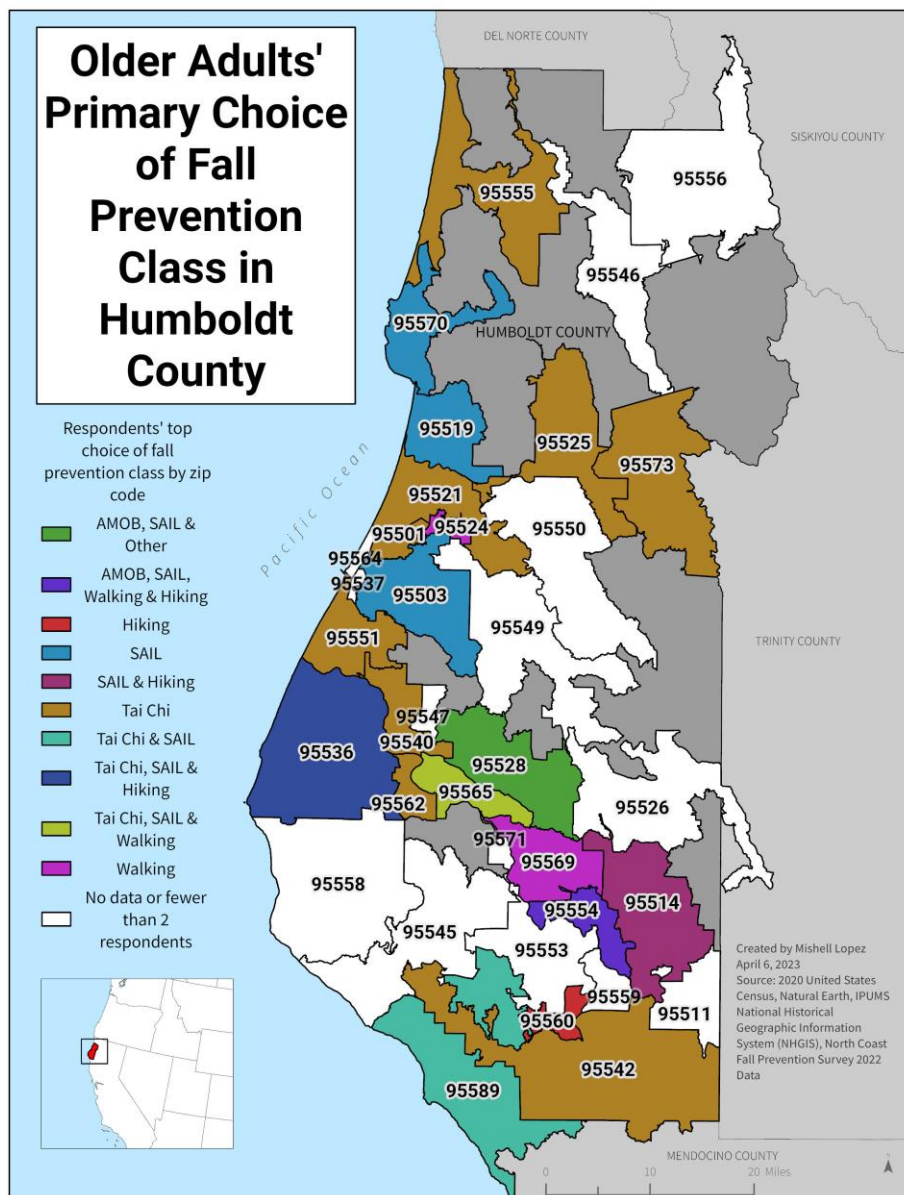


Figure 16. Older adults' primary choice of fall prevention class in Humboldt County by zip code. Carlotta, CA 95528 top choice was a mix of three classes: A Matter of Balance (AMOB), Stay Active and Independent for Life (SAIL), and Other. Redway, CA 95560 top choice was a hiking class. SAIL was the top choice for Eureka, CA 95503, McKinleyville, CA 95519, and Trinidad, CA 95570. Blocksburg, CA 95514 top choice was SAIL and a hiking class. Nine zip codes chose Tai Chi: Eureka CA, 95501, Arcata CA, 95521, Blue Lake, CA 95525, Fortuna, CA 95540, Garberville, CA 95542, Loleta, CA 95551, Orick, CA 95555, Rio Dell, CA 95562, and Willow Creek, CA 95573.

Whitethorn, CA 95589 chose Tai Chi and SAIL. Ferndale, CA 95536 chose Tai Chi, SAIL, and a hiking class. Scotia, CA 95565 chose Tai Chi, SAIL, and a walking class. Last, Bayside, CA 95524 chose a walking class.

However, Tai Chi, the commonly requested fall prevention class, was displayed on nine zip codes: 95501, 95521, 95525, 95540, 95542, 95551, 95555, 95562, and 95573. Three other zip codes (95589, 95536, and 95565) showed Tai Chi as a tie with other fall prevention classes.

DISCUSSION

The first goal of this study was to distribute the NCFP Survey to adults aged 60 years and over residing in Humboldt and Del Norte Counties, conduct a descriptive analysis, and identify fall risk and fall prevention needs. The distribution process of the NCFP Survey 2022 resulted in an understanding that Humboldt and Del Norte participants preferred responding to surveys via paper. Also, distributing the survey through agencies that serve these populations resulted in a higher survey response percentage. Finally, the descriptive analysis revealed various fall risk factors and prevention needs across Humboldt and Del Norte Counties.

The second goal of this study was to visually analyze layers of this data across Humboldt and Del Norte zip codes to reveal fall risks and prevention needs based on geographic location. This visualization describing fall risk differed across zip codes, resulting in different fall prevention needs. In addition, this study provides a first detailed examination and visualization of rural California residents' fall risk factors and needs.

Distribution Process

Despite having two methods to complete the survey, paper-based or web-based, Humboldt and Del Norte Counties participants chose to primarily respond via paper. In a 2010 Netherlands study examining two ways of acquiring data (paper and online), 45% of adults aged 60-70 years responded through paper compared to 71% of adults aged 70-80 years and 82% for adults 80 years and greater (Horevoorts et al., 2015). In our study,

Humboldt County's average participant age was 74, and Del Norte was 73.4 years. We did not analyze disaggregate age groups and response rates, but Humboldt and Del Norte's online eligible responses (3.9% and 2.7%, respectively) are of the younger age group. As our population ages and is more familiar with the internet, future survey studies should continue to provide an online version, as there may be an improvement in online response rates. Furthermore, the online distribution of surveys is inexpensive compared to administering paper surveys.

Of the eight local agencies that received paper copy surveys to distribute across Humboldt and Del Norte Counties, A1AA had the highest percentage of respondents (24%). A1AA encourages healthy aging by connecting older adults with resources. This agency may have received the highest response because they work almost exclusively with older adults. In comparison, the local university Cal Poly Humboldt only received 5.6% of their paper surveys despite sending out 47% more paper copies of the survey than A1AA. A1AA may have received a higher percentage of surveys than Cal Poly Humboldt because A1AA sent out surveys directly to older adults, whereas Cal Poly Humboldt simply distributed surveys to USPS routes with a high density of older adults (> than 60% adults over 60 years). Additionally, older adults may have been skeptical of Cal Poly Humboldt's research intentions contributing to the low response rate.

Dibartolo and McCrone (2003) identified 11 strategies for overcoming barriers in recruiting rural community-dwelling older adults for research. One of the strategies involves finding and collaborating with community "gatekeepers" such as physicians, religious members, and trusted or trusted agencies. Another involves advertising through

different modes, such as newspapers, community bulletin boards, and local agencies.

Although we identified 36 various local agencies and 21 community boards to advertise through, the majority of the agencies and community boards were from Humboldt County. Moreover, many of these agencies and community boards were centered around larger urban population clusters, resulting in less access to rural-dwelling older adults.

Additionally, even though certain gatekeepers of communities, such as local tribes, were made aware of the study, the interest was low, possibly due to a weak relationship between the researchers and these agencies. For example, a member of one agency in Del Norte County after seeing the survey, suggested that elders would probably not fill out the survey because they would view it as too invasive. We have yet to receive any surveys from this agency.

Despite reaching out to over 27 local agencies that work with older adults, only 13 agencies responded and participated in survey distribution. Although this lack of participation cannot be associated with any explanation, many agencies suggested that they did not have the capacity or financial resources to support the distribution of the survey. Given the inherent challenges of outreach and distribution in rural communities, new and innovative strategies for survey distribution and improving response rates are warranted. One possible strategy would be to partner with local agencies to acquire grant funding to support survey marketing and distribution. In addition, feedback from local agencies suggests that the North Coast Fall Prevention program should spend more time planning and developing relationships with key agencies to overcome recruitment and gain acceptance within the communities they serve.

Demographics

In older adults, frailty (defined as having less energy, performance, and strength) places an individual at higher risk of falls because of reduced functional capacities and ability to withstand postural disturbances (Mello et al., 2014). Frailty has been associated with females and older age. Females may be at greater risk of frailty because of menopause, bone loss and reduced physical activity levels. As adults get older, the risk of falls increases due to increased physical activity, sensory impairments, and increased prevalence of chronic conditions (to name a few). In our study, the average age of Humboldt participants was 74 years while Del Norte was 73 years. Additionally, in Humboldt County and Del Norte County, 70.6% and 61.9% (respectively) of the respondents were female. Identifying intrinsic risk factors like demographics identifies target groups for fall prevention.

Although this study was open to all Humboldt and Del Norte Counties adults aged 60 years and over, participants were overwhelmingly “community-dwelling” older adults. Prior research has shown community-dwelling older adults are less frail than institutionalized older adults and thus, the prevalence of risk factors may differ. Del Norte’s participants were 96.7% non-Hispanic, 76.1% Caucasian and 14.2% American Indian. Humboldt County’s participants were 98.1% non-Hispanic, 91.5% Caucasian and 3.6% American Indian. The 2016 US Behavioral Risk Factor Surveillance System revealed, non-Hispanic whites, and American Indians reported higher percentage of falls compared to Hispanics, Asians, and non-Hispanic blacks (Bergen et al., 2021).

More than 94% of Humboldt and Del Norte Counties' participants had an education of 11 years or greater. In a 3-year prospective study, a higher education level of 11 years or greater was a predictor of falls for community-dwelling older adults aged 65 years or greater. There was no discussion as to why this may have occurred. However, one possible explanation may be that older adults with more education have greater socioeconomic privilege and access to health care where they can report falls. Less than half of Humboldt and Del Norte County residents were married. Bergen et al., (2021) found unmarried couples reported higher fall percentages than married couples. Similarly, a systematic review and meta-analysis of sociodemographic factors found adults 80 years fall risk decreased if they were married. The presence of these risk factors can assist with targeted group fall prevention planning. Further research on these sociodemographic variables and fall risk can reveal elaborate risk profiles.

Fall History and Circumstance

A history of falls puts an individual at risk of falling again. Our study found 48% of Humboldt County respondents and 41% of Del Norte had fallen in the last year. Other studies have found a 30-61% prevalence of falls. Moreover, the odds of falling for fallers compared to non-fallers has been reported between 2.6-2.8. Fallers include those who have fallen at least once while recurrent fallers are those that have fallen more than once. Recurrent fallers have 3.1-3.5 higher odds of falling compared to non-fallers. This study did not compare fallers and recurrent fallers, but future research should analyze and

compare Humboldt and Del Norte County fallers and recurrent fallers' risk factors as previous literature has shown differences in risk factors for these two groups.

Falls often are a result of multiple intrinsic and extrinsic factors. An understanding of a previous fall circumstance can reveal risk factors and identify future fall prevention strategies. Our study found in Humboldt County a high prevalence of both rural and urban fallers that fell because they tripped or lost their balance while walking on uneven or level ground, and/or because they were rushing or hurrying. Conversely, Del Norte rural fallers reported a higher prevalence of falling due to tripping and being inattentive while walking on level or uneven ground or going down the stairs, whereas Del Norte urban fallers reported tripping or losing their balance while walking on uneven or level ground or standing. In a community-dwelling older adult sample, Berg et al. (1997) also observed that older adults most commonly fell because they tripped, were walking on level or uneven surfaces, and were hurrying. He also noted they fell more during the afternoon. In our study we found Humboldt County and Del Norte County residents primarily fell outdoors in the afternoon and morning. This may demonstrate older adults are more active during twilight and thus are more likely to interact with hazards, especially outside. This data also supports prior research showing that older adults are more susceptible to falling in low light and high shadows situations and they are more heavily dependent on vision for balance.

Of those participants that received medical assistance for a fall in the prior year, 9% of rural Humboldt County fallers reported receiving physical therapy, 8.6% of urban Humboldt County fallers reported visiting the doctor's office, 14.3% of rural Del Norte

reported visiting the ER, and 11.5% of urban Del Norte most reported visiting the ER. We found higher percentages of fall injuries (69.5% for Humboldt and 86.7% for Del Norte) compared to Tinetti et al., (1995) who reported 23% of fallers had fall injuries. Across Humboldt and Del Norte Counties, the most reported injury was bruises. Traumatic brain injuries occurred in 3.3% of Humboldt County and 4.3% of Del Norte participants, while broken bones occurred in 9.8% of Humboldt County participants and 7.5% of Del Norte. Tinetti et al. (1988) reported 6% of their community-dwelling older adults had fractures. Falls in older adults are the most common cause of traumatic brain injuries and hip fractures among older adults.

Intrinsic Fall Risk Factors (Medical Characteristics)

In both Humboldt and Del Norte counties, several key intrinsic risk factors were observed. Fear of Falling (FOF) was present in both fallers and non-fallers across Humboldt and Del Norte counties with urban fallers in both counties having higher fear of falling percentages than the rest of the participants. In previous studies, FOF prevalence in community-dwelling older adults has ranged from 21-85% for fallers and 33-46% for non-fallers (Kumar et al., 2014). We observed a higher percentage of FOF in non-fallers than in previous literature, however, our percentages for fallers were within the range of previous studies. FOF causes negative physical and psychological consequences such as activity restrictions and decreased mental health. Additional risk factors typically associated with FOF include functional limitations, a need for walking aids, female gender, low income, lower educational levels, and a history of falls

(Denkinger et al., 2013). “A Matter of Balance” (AMOB) is a fall prevention program focused on curtailing FOF by educating older adults about how to cope with FOF and develop fall resilience by mitigating intrinsic and extrinsic fall risks and increasing physical activity levels. Additionally, by identifying and implementing interventions for other fall risk factors associated with FOF, the risk of falling for those individuals with FOF may potentially decrease.

Across Humboldt and Del Norte Counties, fallers had higher percentages of functional restrictions than non-fallers. In a stratified study of AARP Medicare Supplement insured older adults, fall rates were 3 times and 2.5 times higher for individuals who had severe and moderate mobility limitations than those with no limitations (Musich et al., 2018). Moreover, the study found that pain interference and poor health could predict severe and moderate limitations. In our study, 66% of Humboldt and 70.1% of Del Norte participants reported pain in the last 12 months that lasted three or more months. Additionally, 57.8% of Humboldt and 60% of Del Norte Counties’ ($n = 100$) older adults reported activity restriction from pain ($n = 400$). Similarly, to our results, Stubbs et al. (2016) found that among community-dwelling older adults aged 60 years and over, 52% reported chronic musculoskeletal pain (defined as pain that lasted three months in the previous year. Furthermore, those that had chronic musculoskeletal pain had more mobility restrictions and reduced health-related quality of life. Given that pain interference has been associated with increased mobility limitations and mobility limitations are associated with higher fall rates, fall prevention efforts should include identifying populations with pain. In this study, we were able to observe

Humboldt and Del Norte fallers had higher levels of activity restriction from pain. This population could benefit from pain management through the form of balance, mobility, and strengthening exercise programs. Addressing pain and mobility restrictions would not only increase mobility and reduce fall risk, but also possibly reduce health care costs and ER visits, improve quality of life, and increase patient compliance.

The two most reported chronic conditions by Humboldt and Del Norte participants were arthritis or osteoarthritis and hypertension. Individuals with arthritis are 2.5 times more likely to report two or more falls or a fall injury (Barbour et al., 2014). Moreover, the NCOA reported 67% of fall prevention program participants reported having multiple chronic conditions and the most reported were arthritis, heart disease and diabetes (NCOA, 2023). Fall prevention in individuals with chronic conditions should involve management of the disease, support from their primary care provider and a fall prevention program focused on individuals with chronic conditions. Often these individuals curtail their physical activity or show physical limitations due to their diseases and thus further exacerbating their fall risk.

Extrinsic Fall Risk Factors

Home hazards are contributors to falls. Lord et al. (2006) states the relationship between home hazards and falls is between the physical capabilities of an older adult and exposure to home hazards. For example, research has shown older adults with high physical activity levels are more likely to interact with environmental hazards. Moreover, older adults who are frail are less likely to interact with these hazards due either to

mobility limitations, or the decision to move less for various reasons or both. However, due to their weakness, home hazards can increase their risk of falling. Campani et al. (2021) identified four home environment factors to reduce falls: (1) appropriate flooring that is slip-resistant, (2) adequate lighting for night and easy to turn on, (3) appropriate furniture that is not too low or too high, and (4) adequate layouts consisting of enough room to move around and uncluttered pathways. We asked our participants to identify outdoor and indoor home hazards. The most reported indoor hazards across Humboldt and Del Norte older adults were front entrances, edges, throw rugs, bathtubs or showers without grab bars, and pets. For outdoor hazards, commonly reported hazards were uneven surfaces and pets. Older adults in these counties can benefit from home hazard education and help identifying resources to address home hazards. More than 85% of older adults in Humboldt and Del Norte reported never having a home inspection for their risk of falls and except for urban Humboldt County participants, were less willing or could not afford home modifications. Given that Humboldt and Del Norte participants had moderate or high physical activity levels and described having low functional capabilities especially fallers compared to non-fallers, older adults in these areas would benefit from home environmental education as part of a multifactorial intervention.

Shoe wear has been previously identified as a risk factor for falls among older adults. Improper footwear has been shown to affect postural stability due to its negative effects on the somatosensory feedback system. Athletic or canvas shoes with a heel height of less than 1 inch, a fastening mechanism, slip-resistant sole, and a thin firm midsole have all been recommended for older adults as ways of reducing fall risk

(Menant et al., 2008). In prior research, wearing slippers or heel height greater than 1 inch, walking barefoot, and wearing socks without shoes are all associated with falls and increased fall risk. One study found older adults who wore shoes greater than 1-inch had a nearly two-fold increase in risk of falling compared with individuals who wore athletic or canvas shoes. In our study shoes with thick soles were the second most frequently reported shoe wear. In our study, Del Norte and Humboldt Counties' participants commonly reported being barefoot and socks without shoes 21% and 16.8% respectively. Prior research showed wearing socks or walking barefoot increased the older adults' chance of falling by 11 times compared with adults who wore athletic or canvas shoes. Furthermore, slippers have previously been reported as the most common type of footwear worn during a fall and have been associated with foot fractures. In our study, slippers were the third highest reported shoe wear worn by Humboldt and Del Norte respondents. Interestingly and seemingly counter to the results of prior studies, non-fallers in Del Norte across rural and urban areas described wearing slippers 25.7% and 13.3% (respectively) more than fallers.

Common reasons why older adults tend to wear high fall risk shoe wear such as slippers are due to the flexibility and comfort of the soft material (Hatton & Rome, 2019). Studies have shown that older adults who wore slippers often described having foot pain, had foot deformities, and had higher fall risk scores than those who did not wear slippers. Improper shoe wear is a modifiable risk factor, and if identified, can potentially reduce the risk of falls.

Behavioral Risk Factors

Humboldt County respondents were more likely to indicate higher levels of physical activity, muscle strengthening, balance, and flexibility than Del Norte. Although participation in exercise is protective against falls, research has shown physically active individuals are more likely to engage with environmental hazards and are more likely to have injurious falls (Chan et al., 2007). Thus, physically active individuals should still receive fall prevention education especially regarding behavior and environmental risks.

Humboldt and Del Norte Counties fallers generally displayed higher percentages of no physical and muscle activity than non-fallers. Moreover, Del Norte rural fallers showed a higher percentage of no activity compared to urban fallers. One strategy to mitigate falls in these populations is through regular physical activity and exercise. Regular physical activity can improve functional capacity and improve overall health. In one study with resistive exercise, older adults were able to gain 30-80% of muscle strength within a year. There has also been a 15% improvement in flexibility when older adults have undergone flexibility exercises for more than 10 weeks. Del Norte had a 21.7% higher percentage of no participation in local exercise classes or performing balance and flexibility exercises compared to Humboldt County. Increasing physical activity, muscle strength, and increasing balance and flexibility can result in better coordination, improved balance, faster reactions to postural disturbances, improved oxidative metabolism, better sleep, more social contact, higher mental stimulus, more

mobility, and prevention and management of diseases such as hypertension, osteoporosis and diabetes (Shephard, 2017).

Fall Prevention Awareness and Barriers

The American Geriatrics Society, British Geriatrics Society (AGS/BGS) and Centers for Disease (CDC) recommend providers screen older adults annually for a history of falls. However, less than half of older adults report a fall and of those who report a fall, are more likely to be women and have fallen more than three times (Stevens et al., 2012). In our study only 16.4% of Humboldt and 11.9% of Del Norte residents had been assessed by their provider for their risk of falls in the last 12 months. Moreover, the three different screening questionnaires used in this study indicated more than half of Humboldt and Del Norte participants were at a high risk of falling. Except for rural Del Norte participants, more than half of all Humboldt and Del Norte County respondents are willing to receive fall prevention. The most frequently requested method of receiving information was through the internet or private conversation with a health care provider.

This study revealed a need to educate providers in Humboldt and Del Norte on available fall prevention guidelines and local fall prevention resources. Other studies have reported similar findings. Stevens and Phelan (2013) found only 6% of providers were aware of AGS/BGS guidelines and providers described time as a barrier to addressing falls. Community resources with medical professionals willing to provide one-on-one counseling such as the local university Cal Poly Humboldt, public health, and agencies such as Area 1 Agency and the Humboldt Senior Resource center can assist

local fall prevention efforts by targeting locations with high fall risk. Moreover, older adults in these counties would benefit from a website with fall prevention information and education. For those individuals identified as low risk, single modes of exercise such as Tai Chi should be encouraged, however in those identified as having a high fall risk (individuals who have previously fallen), exercises should be part of a multifactorial fall prevention program in which individuals are further assessed for other fall risk factors and provided tailored interventions (Rose, 2008).

In our study, we observed that participants distance and geographic location of medical assistance were important barriers to receiving or accessing help with fall prevention. These barriers were most frequently reported among our rural Humboldt County participants. Financial assistance in the form of grants would greatly assist in bringing targeted fall prevention resources to these rural communities.

Geographic Analysis

As part of this study, we developed maps that display the incidence of falls, fall risk, and fall prevention needs disaggregated by zip code. By displaying the survey results of zip code, community agencies may be better able to strategically allocate resources to support fall prevention among older adults in Humboldt and Del Norte Counties.

Although some of the zip codes contained no data due to lack of respondents, the descriptive analysis of the current data collection can help this study continue and gain further assistance from community partners. The next step of this visual analysis would

be to perform a “site suitability” analysis to identify potential locations to host fall prevention programs. In areas where fall prevention programs exist such as Arcata and Eureka in Humboldt County, these sites should be mapped along with attendance data to determine whether these locations are best utilized in relation to residence with the highest risk for falls.

Strengths

This was the first attempt to identify fall risk and fall prevention needs across Humboldt and Del Norte fallers and non-fallers, their zip codes, and rural and urban categories. We included a wide range of risk factors in this analysis compared to any other study. This study was able to describe community gaps in fall prevention and identify fall prevention programs for different zip codes in easily viewable maps with minimal layers. Moreover, the data presented in this study can be used to further engage local community agencies, gather financial support, and educate the public regarding fall risk and needs in Humboldt and Del Norte Counties.

Limitations

This is a descriptive analysis of Humboldt and Del Norte County residents, therefore these results are not generalizable to other population across California or United States. In this study, our primary goal was to provide a purely descriptive analysis of fall risk and fall prevention needs across Humboldt and Del Norte Counties. We did not perform any post-hoc statistical analysis relating the various intrinsic, socioeconomic

or extrinsic risk factors to fall incidence. However, following this initial descriptive analysis the North Coast Fall Prevention Program will perform a variety of post-hoc analysis where sufficient statistical power exists. Despite meeting the overall sample size required for statistical power in for our Humboldt County data, we did not meet the required sample size for several specific zip codes in Humboldt. Moreover, the overall sample size for Del Norte County was not met, and thus any statistical analysis of these results should be interpreted with caution. Additionally, because this study involved volunteering, there may be self-selection bias. Also, because we asked our participants to recall falls and circumstances in the last 12 months, recall bias may exist.

Another limitation was that the survey was only available in English and thus reduced participation in underrepresented ethnic groups where English is not their primary language. To further strengthen this study, the survey should also be translated to Spanish and Hmong languages as these are ethnic groups with a relatively high population in Humboldt and Del Norte counties. Moreover, to improve participation from our native American tribal elders, the relationships between community agencies and tribes should continue to be nurtured to support trust and collaboration.

CONCLUSION

Humboldt and Del Norte Counties' respondents shared similar fall risk categories such as age, ethnicity, race, FOF presence, presence of pain in the last 12 months and chronic conditions. They also shared similar fall circumstances related to types of injuries sustained from previous falls in the last 12 months, fall location and time of fall. Fallers in both Humboldt and Del Norte displayed less functional capabilities than non-fallers. Additionally, Del Norte County participants were less likely to participate in physical activity, muscle strengthening activity and balance and flexibility than Humboldt County. Del Norte County was less willing to accept fall prevention education than Humboldt County, but Humboldt and Del Norte County agreed their preferred methods of receiving education were through the internet and with a private conversation with a provider. Moreover, the GIS analysis revealed locations that were more rural and further away often displayed higher needs of fall prevention. Humboldt County and Del Norte agreed geographic location and distance were an issue to receiving care.

This descriptive analysis revealed fall risk and prevention is needed in Humboldt and Del Norte, especially in the most rural areas and where fallers are located. It also revealed non-fallers had risk factors such as footwear and pain that puts them at risk of falling. By displaying fall risk and needs across Humboldt and Del Norte County we were able to visually analyze areas the North Coast Fall Prevention Coalition can strategically target for fall prevention. Moreover, this study sets the precedence for future fall risk analysis and showcases the need to continue collaborating with local agencies for

better research results, gather funding to reach more rural populations, and spend more time preparing and collecting information for a much richer understanding and representation of fall risk and needs across Humboldt and Del Norte older adults. Based on what we have learned from this survey study, any future survey of fall risk and fall prevention needs should 1) have sufficient funding for marketing the survey and support subject recruitment, 2) have more direct supported and engagement from a broader group of community partners, and 3) be conducted over a full year period of time with an emphasis on collecting data in those zip codes where no data was obtained.

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APPENDICES

Appendix A. The North Coast Fall Prevention Survey flier

**CAL POLY HUMBOLDT IN COLLABORATION
WITH AREA 1 AGENCY PRESENTS HUMBOLDT
AND DEL NORTE COUNTIES' FIRST**

NORTH COAST FALL PREVENTION SURVEY 2022

We need your assistance!


Who: All adults aged 60 years and over

Background: About one out of every four older adults will fall each year. In older adults, falls can cause fear of falling, functional limitations, reduced independence and even death. In rural areas like Humboldt and Del Norte, provider shortages and reduced medical services can hinder fall prevention efforts.

How to help: If you are 60 years and over and live in Humboldt County or Del Norte please complete our anonymous survey. The survey can be assessed in two ways:




Online: <https://arcg.is/1aP9SH>
or scan with your phone camera

Paper copy: (707) 826-5973



Questions? Please contact
North Coast Fall Prevention at (707) 826-5973

Thank you for your participation!
North Coast Fall Prevention
Cal Poly Humboldt
Area 1 Agency on Aging

Appendix B. The North Coast Fall Prevention Survey components: The cover letter, “Anonymous Exempt Consent” Informed Consent, and the North Coast Fall Prevention Survey

We need your assistance!

Background: Cal Poly Humboldt in collaboration with Area 1 Agency presents Humboldt and Del Norte Counties’ first North Coast Fall Prevention Survey 2022 for adults aged 60 years and over. About one out of every four adults fall each year. Falls are expensive, can result in fear of falling, long hospitalizations, loss of independence and even death in older adults. In rural areas like Humboldt and Del Norte Counties’, provider shortages and reduced medical services can set back fall prevention efforts. **To understand Humboldt and Del Norte’s community fall risk and fall prevention needs we need your participation in this survey!**

What can you do?

If you are at least 60 years or older and live in Humboldt or Del Norte Counties, please complete this anonymous 15-minute survey and **return in the enclosed envelope as soon as possible. Or mail to:**

**North Coast Fall Prevention
Kinesiology Department
1 Harpst Street, Arcata CA 95521.**

If you would like to complete this survey online, you can visit:

<https://arcg.is/1aP9SH>

or scan this QR code with your phone camera:



More information

How will this help? Your answers will help assist Humboldt and Del Norte Counties fall prevention efforts.

Other information: Your answers will be kept strictly confidential and safeguarded. Participation in this anonymous study is voluntary.

Questions? Please call **707-826-5973** or email ml157@humboldt.edu



Thank you for your participation!

Justus Ortega, PhD
North Coast Fall Prevention
Cal Poly Humboldt

Anonymous Exempt Consent
INFORMED CONSENT

Geospatial Analysis of Rural Older Adult Fall Risk and Prevention Needs: An Analysis of the
North Coast Fall Prevention Survey Data

On behalf of the North Coast Fall Prevention Program at Cal Poly Humboldt, We are conducting this research study to understand fall risk and fall prevention needs in Humboldt and Del Norte Counties. If you volunteer to participate, you will be asked to complete this anonymous survey. Your participation in this study will last 15-minutes.

Your participation in this study is voluntary. You have the right not to participate at all or to leave the study at any time without penalty or loss of benefits to which you are otherwise entitled. There are some possible risks involved for participants. These risks are not anticipated to be any greater than risks you encounter in daily life. There are some or no benefits to this research, particularly that the data collected will be used for county fall prevention efforts.

An incentive will not be offered. Your participation in this study is voluntary.

It is anticipated that study results will be shared with the public through presentations and/or publications. Information collected for this study is anticipated to be completely anonymous and cannot be linked back to you. The anonymous data will be maintained in a safe, locked location and may be used for future research studies or distributed to another investigator for future research studies without additional informed consent from you. Raw data will be destroyed after a period of 10 years after study completion.

If you have any questions about this research at any time, please email the North Coast fall Prevention Program Coordinator, Mishell Lopez at ml157@humboldt.edu or call at 707-826-5973. If you have any concerns with this study or questions about your rights as a participant, contact the Institutional Review Board for the Protection of Human Subjects at irb@humboldt.edu or (707) 826-5165.

Your participation in this study indicates that you are 60 years and older, have read and understand the information provided above, that you willingly agree to participate, and that you may withdraw your consent at any time and discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

Please keep this form as your copy.

North Coast Fall Prevention Survey 2022

Fall History

The following questions relate to your fall/s experience in the last 12 months. A fall is defined as an unintentional or sudden loss of balance such that your hands, arms, knees, buttocks, or body touch or hit the ground or floor.

1. Did you experience a fall in the past 12 months?

- YES, answer questions #2 through #10
 NO, **skip to question #11**

2. How many times have you fallen in the past 12 months? _____

3. Have you been injured by one or more falls in the past year? YES NO

4. What type of injury did you sustain from falls experienced in the past 12 months? Mark [X] all that apply.

- | | |
|---|--|
| <input type="checkbox"/> Did not sustain an injury | <input type="checkbox"/> Spinal cord injury |
| <input type="checkbox"/> Dislocation | <input type="checkbox"/> Hemorrhage |
| <input type="checkbox"/> Head/Brain Injury | <input type="checkbox"/> Cuts or abrasions |
| <input type="checkbox"/> Bruises | <input type="checkbox"/> Fractures/broken bones, please specify where: _____ |
| <input type="checkbox"/> Sprains or ligament injury | |

The following questions relate to your most recent fall in the past 12 months.

5. Please indicate the location of your most recent fall. Mark [X] all that apply.

- | | |
|---|---|
| <input type="checkbox"/> Outdoors (Area outside a building) | <input type="checkbox"/> Bedroom |
| <input type="checkbox"/> Home yard | <input type="checkbox"/> Bathroom |
| <input type="checkbox"/> Street curb | <input type="checkbox"/> Kitchen |
| <input type="checkbox"/> Sidewalk | <input type="checkbox"/> Living room |
| <input type="checkbox"/> Parking lot | <input type="checkbox"/> Inside stairs |
| <input type="checkbox"/> Outside stairs | <input type="checkbox"/> Hallway |
| <input type="checkbox"/> Indoors (Any area inside a building) | <input type="checkbox"/> Other, please specify where: _____ |

6. About what time of the day did your most recent fall occur? _____

7. In what direction did you fall?

- Straight down Forward Backwards Sideways Do not remember

<p>8. Indicate the reason for your most recent fall. Mark [X] all that apply.</p>		
<input type="checkbox"/> Tripped	<input type="checkbox"/> Medications	<input type="checkbox"/> Fell out of bed
<input type="checkbox"/> Slipped	<input type="checkbox"/> Alcohol	<input type="checkbox"/> Loss of consciousness
<input type="checkbox"/> Misplaced step	<input type="checkbox"/> Could not see/lighting	<input type="checkbox"/> Got knocked over by someone
<input type="checkbox"/> Loss of balance	<input type="checkbox"/> Fainted	<input type="checkbox"/> Was not paying attention
<input type="checkbox"/> Legs gave away	<input type="checkbox"/> Felt dizzy	<input type="checkbox"/> Other, please specify: _____
<p>9. What activity were you performing leading to your most recent fall? Mark [X] all that apply.</p>		
<input type="checkbox"/> Sitting	<input type="checkbox"/> Changing position	<input type="checkbox"/> Walking on level ground or floor
<input type="checkbox"/> Lying down	<input type="checkbox"/> Using a stool/ladder	<input type="checkbox"/> Walking on uneven ground
<input type="checkbox"/> Standing	<input type="checkbox"/> Gardening	<input type="checkbox"/> Rushing or hurrying
<input type="checkbox"/> Cooking	<input type="checkbox"/> Home improvements	<input type="checkbox"/> Running
<input type="checkbox"/> Eating	<input type="checkbox"/> Going up the stairs	<input type="checkbox"/> Hiking
<input type="checkbox"/> Reaching	<input type="checkbox"/> Going down the stairs	<input type="checkbox"/> Walking a pet
<input type="checkbox"/> Bathing	<input type="checkbox"/> Sitting down	<input type="checkbox"/> Turning around
<input type="checkbox"/> Bending	<input type="checkbox"/> Getting up from sitting	<input type="checkbox"/> Carrying heavy or bulky items
<input type="checkbox"/> Using restroom	<input type="checkbox"/> Playing sports	<input type="checkbox"/> Other: _____
<p>10. What type of medical services did you receive because of your recent fall? Mark [X] all that apply.</p>		
<input type="checkbox"/> I did not seek any assistance	<input type="checkbox"/> Visited hospital emergency department	
<input type="checkbox"/> Called 911	<input type="checkbox"/> Spent at least one night in hospital	
<input type="checkbox"/> Received ambulance services	<input type="checkbox"/> Required surgery	
<input type="checkbox"/> Went to doctor's office	<input type="checkbox"/> Required rehab/physical therapy	
<input type="checkbox"/> Required visits to medical specialist	<input type="checkbox"/> Other, please specify: _____	
<p>Health Status</p>		
<p>11. What is your current weight? _____ Height: _____</p>		
<p>12. In the last 12 months, have you had pain that lasted 3 or more months in any area of your body? <input type="checkbox"/> YES, answer questions #13 through #15 <input type="checkbox"/> NO, skip to question #16</p>		
<p>13. Please indicate any area of your body you have felt pain in the last 12 months that lasted at least 3 months or more. Mark all that apply.</p>		
<input type="checkbox"/> Hip	<input type="checkbox"/> Hands	<input type="checkbox"/> Shoulders
<input type="checkbox"/> Back	<input type="checkbox"/> Knee	<input type="checkbox"/> Neck
<input type="checkbox"/> Foot	<input type="checkbox"/> Wrist	<input type="checkbox"/> Other, specify: _____

14. Does the pain prevent you from moving? <input type="checkbox"/> Always <input type="checkbox"/> Often <input type="checkbox"/> Sometimes <input type="checkbox"/> Never	
15. Are you currently taking any medications to manage your pain? <input type="checkbox"/> YES <input type="checkbox"/> NO	
16. Do you have any chronic medical conditions? <input type="checkbox"/> YES <input type="checkbox"/> NO If NO, skip to question #18	
17. Has a health care professional told you that you had any of the following conditions? Mark [X] all that apply.	Are you taking any medications for the condition(s) you have?
<input type="checkbox"/> Alzheimer's	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Chronic Obstructive Pulmonary Disease (COPD)	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Cancer	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Cardiovascular disease/heart disease	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Deafness	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Dementia	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Depression	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Diabetes	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Dizziness or vertigo	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Epilepsy	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> History of stroke	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Hypertension	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Neuropathy	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Orthostatic hypotension/postural hypotension	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Osteoarthritis or arthritis	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Osteoporosis	<input type="checkbox"/> YES <input type="checkbox"/> NO

<input type="checkbox"/> Sleeping disorders such as insomnia	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Syncope/loss of consciousness	<input type="checkbox"/> YES <input type="checkbox"/> NO
<input type="checkbox"/> Urinary incontinence	<input type="checkbox"/> YES <input type="checkbox"/> NO

Prescribed Medication

18. Do you take prescribed medicines? (If NO skip to question #24) <input type="checkbox"/> YES <input type="checkbox"/> NO
19. Do you know what medications you are taking? <input type="checkbox"/> YES <input type="checkbox"/> NO
20. Has your doctor or pharmacist talked to you about how the medication you are taking may affect your balance? <input type="checkbox"/> YES <input type="checkbox"/> NO
21. Do you take any prescribed medicine to help you sleep? <input type="checkbox"/> YES <input type="checkbox"/> NO
22. Do you take any prescribed medicine to improve your mood? <input type="checkbox"/> YES <input type="checkbox"/> NO
23. How many prescription medicines do you take? _____

Functional Limitations

The following questions relate to you balance and mobility in the last 12 months.				
	Always	Often	Sometimes	Never
24. Are you afraid of falling?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Have you restricted your activity because of your fear of falling?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Do you feel unsteady when you are walking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Do you feel you have problems with balance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Are you able to bend down, stoop or kneel without assistance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Can you walk up/downstairs alone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Do you need to use your hands or get assistance to stand up from a chair?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. Do you use a walker, cane, or any other form of assistance for your mobility?	Always <input type="checkbox"/>	Often <input type="checkbox"/>	Sometimes <input type="checkbox"/>	Never <input type="checkbox"/>
32. Because of any health problem, do you need help from other people with your	Always	Often	Sometimes	Never
a. PERSONAL CARE needs (eating, bathing, dressing, or getting around the house)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. HANDLING CHORES OR ERRANDS (household chores, shopping, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Lifestyle

<p>33. How would you describe your (current) daily physical activity level? (<i>Moderate physical activity is when your heart works harder and your breathing gets deeper and faster and can include dancing, hiking, exercising, walking etc.</i>)</p> <p><input type="checkbox"/> I am engaged in moderate physical activity 30min/day, 5-7 days/week.</p> <p><input type="checkbox"/> I am engaged in moderate physical activity at least 30min/day, 2-4 times/week.</p> <p><input type="checkbox"/> I am generally not active and don't participate in moderate physical activity.</p>
<p>34. How would you describe your weekly muscle-strengthening activities that work major muscle groups (i.e., legs, hips, back, chest, shoulders, and arms)?</p> <p><input type="checkbox"/> I am engaged in muscle-strengthening activities at least twice a week.</p> <p><input type="checkbox"/> I am engaged in muscle-strengthening activities at least once a week.</p> <p><input type="checkbox"/> I generally do not perform any muscle-strengthening activities.</p>
<p>35. Do you participate in activities to improve your balance, flexibility, or both? Mark [X] all that apply.</p> <p><input type="checkbox"/> Yes, I stretch or do balance exercises by myself</p> <p><input type="checkbox"/> Yes, I perform balance exercises prescribed by my physical therapist</p> <p><input type="checkbox"/> Yes, I participate in a local class. Please indicate all that apply.</p> <p style="padding-left: 20px;"><input type="checkbox"/> SAIL <input type="checkbox"/> A Matter of Balance <input type="checkbox"/> Tai Chi <input type="checkbox"/> Other, specify: _____</p> <p><input type="checkbox"/> I do NOT participate in activities to help improve my balance or flexibility</p>

Environmental Risk Factors

<p>36. What kind of shoes do you regularly wear? Mark [X] all that apply</p> <p><input type="checkbox"/> Slippers <input type="checkbox"/> Barefoot</p> <p><input type="checkbox"/> Shoes with thick soles (>1 INCH) <input type="checkbox"/> Socks without shoes</p> <p><input type="checkbox"/> Shoes with thin soles (~1 inch or less) <input type="checkbox"/> Other, please specify: _____</p>

37. Have you ever had your home inspected for fall injury prevention? <input type="checkbox"/> YES <input type="checkbox"/> NO	
38. Rate how willing you are to pay for home modifications to reduce risk of injury? Cannot afford/not willing <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 Very willing	
39. Take a moment to look around the inside of your home. Do you notice any of the following? Mark [X] all that apply.	
<input type="checkbox"/> Throw rugs	<input type="checkbox"/> Visible cords on the ground
<input type="checkbox"/> Slippery surfaces	<input type="checkbox"/> Poor or no lighting around pathways
<input type="checkbox"/> Loose or worn carpets	<input type="checkbox"/> Pets around your feet such as a dog or cat
<input type="checkbox"/> Clutter on the ground	<input type="checkbox"/> Bathtub or shower area without grab bars
<input type="checkbox"/> Cluttered pathways/halls	<input type="checkbox"/> Edge you must step over at the front entrance
<input type="checkbox"/> Staircases without railings	<input type="checkbox"/> Edge you must step over at the bathtub
<input type="checkbox"/> Furniture in the way of walking	<input type="checkbox"/> Items placed in hard-to-reach areas
<input type="checkbox"/> Too low or too high toilet height	<input type="checkbox"/> Light switch or light far away from the bed
<input type="checkbox"/> Too low or too high bed height	<input type="checkbox"/> Phone is not easily accessible
40. Take a moment to look outside your home. Do you notice any of the following around your garden, front/back yard etc.? Mark [X] all that apply.	
<input type="checkbox"/> Steps or walking surfaces are slippery	
<input type="checkbox"/> Stairs do not have railing	
<input type="checkbox"/> Poor or no lighting around walkways	
<input type="checkbox"/> Surfaces of stairs and ground are uneven	
<input type="checkbox"/> Walkways flood with water when it rains	
<input type="checkbox"/> Pets or other animals around your feet	
<input type="checkbox"/> Items on walkways (e.g., flowerpots, hoses, etc.)	
<input type="checkbox"/> Items are placed in hard-to-reach areas	
Fall Prevention Needs Assessment	
41. How would you rate your likelihood of falling in the next 12 months? <input type="checkbox"/> None <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High	42. In the past 12 months, have you been assessed by a health care professional for your risk of falling? <input type="checkbox"/> Yes <input type="checkbox"/> No
43. Are you willing to receive fall prevention education <input type="checkbox"/> YES <input type="checkbox"/> NO	

44. What is your preferred format of receiving information? Mark [X] your top three.

Television Newspaper Class
 Radio Internet Private conversation with health professional
 Other, please specify: _____

45. Which fall prevention classes would you be willing to take if offered for free? Mark [X] your top three.

Tai Chi (balance)
 A Matter of Balance-AMOB (balance, strength, fear of falling)
 Stay Active and Independent for Life-SAIL (balance, strength, mobility)
 Walking group on flat ground (balance, strength, mobility)
 Hiking group on different trails (balance, strength, mobility)
 Biking group on flat ground (balance, strength, mobility)
 Other, please specify: _____

46. In general, what are the barriers, if any, to receiving or accessing the help you need regarding your physical health?

Demographics

47. What is your zip code? _____

48. What is the closest town/city to your home? _____

49. As of today, my age is _____ years

50. What is your gender? Male Female Other, please specify: _____

51. What is your marital status? Married Widowed Single Divorced
 Partnered, not married Other, please specify: _____

<p>52. What best describes your educational background?</p> <p><input type="checkbox"/> 0-11 years, no diploma <input type="checkbox"/> High school graduated or GED <input type="checkbox"/> Some college <input type="checkbox"/> Associate's degree <input type="checkbox"/> Bachelor's degree <input type="checkbox"/> Graduate or other professional degree</p>	<p>53. What is your yearly income (including Soc. Security, pension, investments)?</p> <p><input type="checkbox"/> Less than \$10,000 <input type="checkbox"/> \$10,000 to less than \$20,000 <input type="checkbox"/> \$20,000 to less than \$30,000 <input type="checkbox"/> \$30,000 to less than \$40,000 <input type="checkbox"/> \$40,000 to less than \$50,000 <input type="checkbox"/> \$50,000 to less than \$60,000 <input type="checkbox"/> \$60,000 to less than \$70,000 <input type="checkbox"/> \$70,000 to less than \$80,000 <input type="checkbox"/> \$80,000 and more</p>
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54. What is your ethnicity? <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Non-Hispanic or Latino	
55. What is your race? Mark [X] all that apply.	
<input type="checkbox"/> Asian	<input type="checkbox"/> Black or African American
<input type="checkbox"/> Hispanic or Latino	<input type="checkbox"/> American Indian or Alaskan Native, please specify what tribe: _____
<input type="checkbox"/> Caucasian/White	<input type="checkbox"/> Other, please specify: _____
<input type="checkbox"/> Native Hawaiian, Pacific Islander	
56. What type of residence do you live in?	
<input type="checkbox"/> House	<input type="checkbox"/> Nursing home
<input type="checkbox"/> Condo/townhouse	<input type="checkbox"/> Shelter or dormitory
<input type="checkbox"/> Apartment	<input type="checkbox"/> Homeless
<input type="checkbox"/> Senior independent living apartment	<input type="checkbox"/> Other, please specify: _____
<input type="checkbox"/> Group home or assisted living facility	
57. Have you ever served in the active military of the United States? <input type="checkbox"/> YES <input type="checkbox"/> NO	
If NO , skip a-c questions.	
a. During what years were you in active service? _____	
b. Do you have a VA Service-connected disability rating? <input type="checkbox"/> YES <input type="checkbox"/> NO	
c. What is your service-connected disability rating? _____	

Thank you for your time! Please use the provided self-addressed envelope to send this survey.

If you have any questions or further comments, please contact Mishell Lopez at the North Coast Fall Prevention Coalition (707-826-5973)

End of Survey.

Appendix C. All tables for this study are listed in this section.

Table 1. Humboldt County, CA, and Del Norte County, CA, calculated sample size using the formula of Sample for Proportions and 2020 U.S. Census older adult population.

California Counties	2020 U.S. Census Older Adult Population	Sample for Proportions
Del Norte	6907	378
Humboldt	34079	395

Table 2. Humboldt County, CA, calculated sample sizes using the formulas of Sample for Proportions, and Finite Population Corrections for Proportions. The 2020 U.S. Census older adult population was used for each formula.

Zip codes	2020 U.S. Census Older Adult Population	Sample for Proportions	Finite Population Corrections for Proportions
95501	5185	371	347
95503	7038	378	359
95511	63	54	29
95514	23	22	11
95519	4564	368	340
95521	3850	362	331
95524	648	247	179
95525	611	242	173
95526	119	92	52
95528	486	219	151
95536	1109	294	233
95537	50	44	24
95540	3229	356	321
95542	735	259	192
95545	30	28	15
95546	1027	288	225
95547	460	214	146
95549	254	155	97
95550	17	16	9
95551	296	170	108
95553	203	135	81
95554	254	155	97
95555	98	79	44
95556	130	98	56
95558	184	126	75
95559	47	42	22
95560	517	226	157
95562	756	262	195
95564	153	111	64
95565	140	104	60
95569	64	55	30
95570	755	261	194
95571	11	11	6
95573	450	212	144
95589	523	227	158

Table 3. Del Norte County, CA, calculated sample sizes using the formulas of Sample for Proportions, and Finite Population Corrections for Proportions. The 2020 U.S. Census older adult population was used for each formula.

Zip Codes	2020 U.S. Census Older Adult Population	Sample for Proportions	Finite Population Corrections for Proportions
95531	5554	373	350
95543	274	163	102
95548	391	198	132
95567	688	253	185

Table 4: Community organizations in Humboldt County, CA, and Del Norte County, CA, notified of the North Coast Fall Prevention (NCFP) Survey. *UIHS = United Indian Health Services.

Organization	Location of Organization
Del Norte County Public Health	Del Norte County
Del Norte Senior Center	Del Norte County
Family Resource Center of the Redwoods	Del Norte County
Wild Rivers Outpost online news	Del Norte County
Del Norte Triplicate newspaper	Del Norte County
Rotary Club of Crescent City	Del Norte County
Soroptimist International of Crescent City	Del Norte County
Cal Poly Humboldt	Del Norte and Humboldt County
Area 1 Agency on Aging	Del Norte and Humboldt County
UIHS*	Del Norte and Humboldt County
Yurok Tribe	Parts of Humboldt and Del Norte County
Bicoastal Media radio station	Parts of Humboldt and Del Norte County
KHSU radio station	Parts of Humboldt and Del Norte County
Humboldt County Public Health	Humboldt County
Humboldt Senior Resource Center	Humboldt County
Food for People	Humboldt County
Times Standard newspaper	Humboldt County
Adorni Recreation Center	Humboldt County
Eureka Silvercrest Residences	Humboldt County
Rotary Club of Eureka	Humboldt County
Rotary Club of Old Town Eureka	Humboldt County
Soroptimist International Humboldt Bay	Humboldt County
Azalea Hall and McKinleyville Community Center	Humboldt County
Arcata Community Center	Humboldt County
Rotary Club of Arcata	Humboldt County
Rotary Club of Arcata Sunrise	Humboldt County
Blue Lake Community Resource Center	Humboldt County
Ferndale Community Center	Humboldt County
Fortuna Senior Center	Humboldt County
K'ima:w Medical Center of the Hoopa Valley Tribe	Humboldt County
Healy Senior Center	Humboldt County
Willow Creek Community Resource Center	Humboldt County
Blue Lake Rancheria	Parts of Humboldt County
Karuk Tribe	Parts of Humboldt County
Wiyot Tribe	Parts of Humboldt County
KMUD radio station	Parts of Humboldt County

Table 5. Name and location of community boards across Humboldt County, CA, and Del Norte County, CA, used to display the North Coast Fall Prevention (NCFP) Survey flier.

Name of Location of Community Board	Location
Del Norte County Public Health	Del Norte County, CA 95531
Del Norte Veteran Service Office	Del Norte County, CA 95531
Del Norte Library District	Del Norte County, CA 95531
Eureka Vet Center	Humboldt County, CA 95501
North Coast Co-Op-Eureka	Humboldt County, CA 95501
Ramone's Bakery & Café-Harrison Ave, Eureka	Humboldt County, CA 95501
Eureka Natural Foods-Eureka	Humboldt County, CA 95501
EPT McKinleyville	Humboldt County, CA 95519
Murphy's Markets-McKinleyville	Humboldt County, CA 95519
Eureka Natural Foods-McKinleyville	Humboldt County, CA 95519
Murphy's Markets-Bayside	Humboldt County, CA 95521
North Coast Co-Op-Arcata	Humboldt County, CA 95521
Humboldt County Library-Garberville	Humboldt County, CA 95542
Ray's Food Place-Garberville	Humboldt County, CA 95542
Chautauqua Natural Foods-Garberville	Humboldt County, CA 95542
Orick Market	Humboldt County, CA 95555
Shop Smart Food Warehouse-Redway	Humboldt County, CA 95560
Trinidad Town Hall	Humboldt County, CA 95570
Trinidad USPS	Humboldt County, CA 95570
Trinidad Trading Company	Humboldt County, CA 95570
Murphy's Markets-Trinidad	Humboldt County, CA 95570

Table 6. Organizations in Humboldt County, CA, and Del Norte County, CA, who requested paper copies of the survey to distribute. The total number of paper surveys provided and the number of paper copies received from the organizations are listed.

Organization	Surveys Provided	Surveys Returned
Area 1 Agency on Aging	2211	531
Blue Lake Community Resource Center	33	3
Cal Poly Humboldt	3250	181
Del Norte Senior Center	261	8
Healy Senior Center	25	0
UIHS	150	15
Willow Creek Community Resource Center	25	5
Yurok Tribe	25	0

Table 7. The total number of paper and online surveys received from the zip codes of Humboldt County, CA. Also displayed are the total number of surveys received and the names of the zip code.

Zip Code	Name of Zip Code	Surveys Returned	Paper	Online
95501	Eureka	102	99	3
95503	Eureka	136	132	4
95511	Alderpoint	1	1	0
95514	Blocksburg	3	3	0
95519	McKinleyville	75	71	4
95521	Arcata	97	94	3
95524	Bayside	14	14	0
95525	Blue Lake	13	12	1
95526	Ruth	0	0	0
95528	Carlotta	1	1	0
95536	Ferndale	4	4	0
95537	Fields Landing	1	1	0
95540	Fortuna	47	43	4
95542	Garberville	26	25	1
95545	Honeydew	0	0	0
95546	Hoopa	1	1	0
95547	Hydesville	1	1	0
95549	Kneeland	1	1	0
95550	Korbel	0	0	0
95551	Loleta	7	6	1
95553	Miranda	0	0	0
95554	Myers Flat	5	4	1
95555	Orick	12	12	0
95556	Orleans	0	0	0
95558	Petrolia	2	2	0
95559	Phillipsville	0	0	0
95560	Redway	2	2	0
95562	Rio Dell	4	4	0
95564	Samoa	0	0	0
95565	Scotia	1	1	0
95569	Redcrest	3	3	0
95570	Trinidad	19	18	1
95571	Weott	0	0	0
95573	Willow Creek	5	5	0
95589	Whitethorn	32	31	1

Table 8. The total number of paper and online surveys received from the zip codes of Del Norte County, CA. Also displayed are the total number of surveys received and the names of the zip code.

Zip Code	Name of Zip Code	Surveys Returned	Paper	Online
95531	Crescent City	95	92	3
95543	Gasquet	9	9	0
95548	Klamath	4	3	1
95567	Smith River	39	39	0

Table 9: Humboldt County, CA, participants' demographics separated by rural and urban. * Denotes characteristic is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions. † Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Characteristic	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Age (years)*	74.0 \pm 7.5	72.4 \pm 7.1	74.4 \pm 7.5
Gender (n)	612	130	482
Male	178 (29.1%)	45 (34.6%)	133 (27.6%)
Female	432 (70.6%)	85 (65.4%)	347 (72.0%)
Other	2 (0.3%)	0 (0.0%)	2 (0.4%)
Ethnicity (n)	568	122	437
Non-Hispanic	557 (98.1%)	117 (95.9%)	432 (98.9%)
Hispanic	11 (1.9%)	5 (4.1%)	5 (1.1%)
Race (n)†	611	134	477
Asian	2 (0.3%)	0 (0.0%)	2 (0.4%)
Hispanic or Latino	9 (1.5%)	4 (3.0%)	5 (1.0%)
Caucasian	559 (91.5%)	117 (87.3%)	442 (92.7%)
Black or African American	3 (0.5%)	1 (0.7%)	2 (0.4%)
Native Hawaiian or Pacific Islander	1 (0.2%)	1 (0.7%)	0 (0.0%)
American Indian	22 (3.6%)	8 (6.0%)	14 (2.9%)
Other	15 (2.5%)	3 (2.2%)	12 (2.5%)
Educational Background (n)	612	129	483
0-11, no diploma	7 (1.1%)	3 (2.3%)	4 (0.8%)
Highschool graduate or GED	56 (9.2%)	17 (13.2%)	39 (8.1%)
Some College	127 (20.8%)	27 (20.9%)	100 (20.7%)
Associates	51 (8.3%)	14 (10.9%)	37 (7.7%)
Bachelors	156 (25.5%)	33 (25.6%)	123 (25.5%)
Graduate or professional	215 (35.1%)	35 (27.1%)	180 (37.3%)

Table 10. Del Norte County, CA, participants' demographics separated by rural and urban clusters. * Denotes characteristic is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions. † Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Characteristic	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Age (years)*	73.4 \pm 7.6	73.6 \pm 8.3	73.3 \pm 7.2
Gender (n)	147	52	95
Male	56 (38.1%)	22 (42.3%)	34 (35.8%)
Female	91 (61.9%)	30 (57.7%)	61 (64.2%)
Other	0 (0.0%)	0 (0.0%)	0 (0.0%)
Ethnicity (n)	123	45	78
Non-Hispanic	119 (96.7%)	45 (100.0%)	74 (94.9%)
Hispanic	4 (3.3%)	0 (0.0%)	4 (5.1%)
Race (n)†	155	51	104
Asian	2 (1.3%)	1 (2.0%)	1 (1.0%)
Hispanic or Latino	3 (1.9%)	0 (0.0%)	3 (2.9%)
Caucasian	118 (76.1%)	37 (72.5%)	81 (77.9%)
Black or African American	2 (1.3%)	0 (0.0%)	2 (1.9%)
Native Hawaiian or Pacific Islander	0 (0.0%)	0 (0.0%)	0 (0.0%)
American Indian	22 (14.2%)	10 (19.6%)	12 (11.5%)
Other	8 (5.2%)	3 (5.9%)	5 (4.8%)
Educational Background (n)	146	52	94
0-11, no diploma	8 (5.5%)	2 (3.8%)	6 (6.4%)
Highschool graduate or GED	19 (13.0%)	4 (7.7%)	15 (16.0%)
Some College	44 (30.1%)	14 (26.9%)	30 (31.9%)
Associates	25 (17.1%)	14 (26.9%)	11 (11.7%)
Bachelors	16 (11.0%)	8 (15.4%)	8 (8.5%)
Graduate or professional	34 (23.3%)	10 (19.2%)	24 (25.5%)

Table 11. Humboldt County CA, participants' socio-economic status separated by rural and urban clusters.

Characteristic	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Marital Status (n)	607	129	478
Married	256 (42.2%)	55 (42.6%)	201 (42.1%)
Widowed	136 (22.4%)	28 (21.7%)	108 (22.6%)
Single	78 (12.9%)	14 (10.9%)	64 (13.4%)
Divorced	97 (16.0%)	23 (17.8%)	74 (15.5%)
Partnered, not married	40 (6.6%)	9 (7.0%)	31 (6.5%)
Yearly Income (n)	558	118	440
Less than 10k	21 (3.8%)	6 (5.1%)	15 (3.4%)
10k-20k	86 (15.4%)	25 (21.2%)	61 (13.9%)
20k-30k	92 (16.5%)	16 (13.6%)	76 (17.3%)
30k-40k	77 (13.8%)	17 (14.4%)	60 (13.6%)
40k-50k	39 (7.0%)	9 (7.6%)	30 (6.8%)
50k-60k	41 (7.3%)	9 (7.6%)	32 (7.3%)
60k-70k	38 (6.8%)	7 (5.9%)	31 (7.0%)
70k-80k	39 (7.0%)	8 (6.8%)	31 (7.0%)
80k+	125 (22.4%)	21 (17.8%)	104 (23.6%)
Type of Residence (n)	612	130	482
House	556 (90.8%)	125 (96.2%)	431 (89.4%)
Condo/Townhouse	6 (1.0%)	1 (0.8%)	5 (1.0%)
Apartment	28 (4.6%)	3 (2.3%)	25 (5.2%)
Senior independent living	2 (0.3%)	0 (0.0%)	2 (0.4%)
Group home/assisted living	1 (0.2%)	0 (0.0%)	1 (0.2%)
Nursing Home	1 (0.2%)	0 (0.0%)	1 (0.2%)
Mobile	16 (2.6%)	1 (0.8%)	15 (3.1%)
Shelter	0 (0.0%)	0 (0.0%)	0 (0.0%)
Homeless	0 (0.0%)	0 (0.0%)	0 (0.0%)
Other	2 (0.3%)	0 (0.0%)	2 (0.4%)
Veteran (n)	609	129	480
No	548 (90.0%)	114 (88.4%)	434 (90.4%)
Yes	61 (10.0%)	15 (11.6%)	46 (9.6%)
VA Service-connected (n)	56	13	43
No	44 (78.6%)	10 (76.9%)	34 (79.1%)
Yes	12 (21.4%)	3 (23.1%)	9 (20.9%)

Table 12. Del Norte County, CA, participants' socio-economic status separated by rural and urban clusters.

Characteristic	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Marital Status (n)	147	52	95
Married	68 (46.3%)	24 (46.2%)	44 (46.3%)
Widowed	29 (19.7%)	7 (13.5%)	22 (23.2%)
Single	21 (14.3%)	8 (15.4%)	13 (13.7%)
Divorced	21 (14.3%)	12 (23.1%)	9 (9.5%)
Partnered, not married	8 (5.4%)	1 (1.9%)	7 (7.4%)
Yearly Income (n)	132	47	85
Less than 10k	8 (6.1%)	1 (2.1%)	7 (8.2%)
10k-20k	29 (22.0%)	9 (19.1%)	20 (23.5%)
20k-30k	26 (19.7%)	11 (23.4%)	15 (17.6%)
30k-40k	12 (9.1%)	3 (6.4%)	9 (10.6%)
40k-50k	9 (6.8%)	4 (8.5%)	5 (5.9%)
50k-60k	8 (6.1%)	3 (6.4%)	5 (5.9%)
60k-70k	8 (6.1%)	2 (4.3%)	6 (7.1%)
70k-80k	6 (4.5%)	1 (2.1%)	5 (5.9%)
80k+	26 (19.7%)	13 (27.7%)	13 (15.3%)
Type of Residence (n)	147	52	95
House	110 (74.8%)	41 (78.8%)	69 (72.6%)
Condo/Townhouse	2 (1.4%)	0 (0.0%)	2 (2.1%)
Apartment	10 (6.8%)	1 (1.9%)	9 (9.5%)
Senior independent living	2 (1.4%)	0 (0.0%)	2 (2.1%)
Group home/assisted living	0 (0.0%)	0 (0.0%)	0 (0.0%)
Nursing Home	0 (0.0%)	0 (0.0%)	0 (0.0%)
Mobile	23 (15.6%)	10 (19.2%)	13 (13.7%)
Shelter	0 (0.0%)	0 (0.0%)	0 (0.0%)
Homeless	0 (0.0%)	0 (0.0%)	0 (0.0%)
Other	0 (0.0%)	0 (0.0%)	0 (0.0%)
Veteran (n)	146	52	94
No	125 (85.6%)	45 (86.5%)	80 (85.1%)
Yes	21 (14.4%)	7 (13.5%)	14 (14.9%)
VA Service Connected (n)	18	7	11
No	14 (77.8%)	6 (85.7%)	8 (72.7%)
Yes	4 (22.2%)	1 (14.3%)	3 (27.3%)

Table 13. Humboldt County, CA, fall risk separated by rural and urban clusters screened by three screening tools. *3 Key Qs = Three Key Questions (Eckstrom et al., 2017); MAHC-10 = Missouri Alliance for Home Care Fall Risk Assessment Tool (Calys et al., 2013). STEADI 12-Q = Stopping Elderly Accidents, Deaths, & Injuries Stay Independent Fall Risk Assessment Tool (Rubenstein et al., 2011). † Denotes characteristic is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions.

Screening Tool	Humboldt (<i>N</i> = 615)	Rural (<i>n</i> = 130)	Urban (<i>n</i> = 485)
3 Key Qs* (n)	615	130	485
Not at risk	91 (14.8%)	21 (16.2%)	70 (14.4%)
At risk	524 (85.2%)	109 (83.8%)	415 (85.6%)
MAHC-10* (n)	615	130	485
Score†	4.1 \pm 1.6	3.9 \pm 1.4	4.2 \pm 1.6
Not at risk	234 (38.0%)	60 (46.2%)	174 (35.9%)
At risk	381 (62.0%)	70 (53.8%)	311 (64.1%)
STEADI 12-Q* (n)	615	130	147
Score†	4.1 \pm 2.6	3.7 \pm 2.4	4.2 \pm 2.7
Not at risk	277 (45.0%)	67 (51.5%)	210 (43.3%)
At risk	338 (55.0%)	63 (48.5%)	275 (56.7%)

Table 14. Del Norte County, CA, fall risk separated by rural and urban clusters screened by three screening tools. *3 Key Qs = Three Key Questions (Eckstrom et al., 2017); MAHC-10 = Missouri Alliance for Home Care Fall Risk Assessment Tool (Calys et al., 2013). STEADI 12-Q = Stopping Elderly Accidents, Deaths, & Injuries Stay Independent Fall Risk Assessment Tool (Rubenstein et al., 2011). † Denotes characteristic is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions.

Screening Tool	Del Norte (<i>N</i> = 147)	Rural (<i>n</i> = 52)	Urban (<i>n</i> = 95)
3 Key Qs* (n)	147	52	95
Not at risk	23 (15.6%)	6 (11.5%)	17 (17.9%)
At risk	124 (84.4%)	46 (88.5%)	78 (82.1%)
MAHC-10* (n)	147	52	95
Score†	4.3 \pm 1.6	4.1 \pm 1.6	4.5 \pm 1.6
Not at risk	46 (31.3%)	17 (32.7%)	29 (30.5%)
At risk	101 (68.7%)	35 (67.3%)	66 (69.5%)
STEADI 12-Q* (n)	147	52	95
Score†	4.2 \pm 2.8	4.0 \pm 2.6	4.3 \pm 2.8
Not at risk	68 (31.3%)	27 (51.9%)	41 (43.2%)
At risk	79 (53.7%)	25 (48.1%)	54 (56.8%)

Table 15. Humboldt County, CA, participants' fall history separated by rural and urban clusters. * Denotes number of falls is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions. † Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Fall History	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Fall history (n)	615	130	485
Non-faller	320 (52.0%)	60 (46.2%)	260 (56.6%)
Faller	295 (48.0%)	70 (53.8%)	225 (46.4%)
Number of falls*	1.4 \pm 6.0	3.2 \pm 12.5	1.0 \pm 1.8
Injured by a fall (n)	292	70	222
No	89 (30.5%)	24 (34.3%)	65 (29.3%)
Yes	203 (69.5%)	46 (65.7%)	157 (70.7%)
Type of injury (n)†	450	101	349
None	84 (18.7%)	22 (21.8%)	62 (17.8%)
Dislocation	6 (1.3%)	3 (3.0%)	3 (0.9%)
Head/Brain	15 (3.3%)	1 (1.0%)	14 (4.0%)
Bruises	146 (32.4%)	30 (29.7%)	116 (33.2%)
Sprain/ligament	48 (10.7%)	8 (7.9%)	40 (11.5%)
Spinal	2 (0.4%)	1 (1.0%)	1 (0.3%)
Hemorrhage	2 (0.4%)	0 (0.0%)	2 (0.6%)
Cuts/abrasions	90 (20.0%)	22 (21.8%)	68 (19.5%)
Broken bones/fractures	44 (9.8%)	12 (11.9%)	32 (9.2%)
Other	13 (2.9%)	2 (2.0%)	11 (3.2%)
Medical services received (n)†	367	89	278
No assistance	227 (61.9%)	54 (60.7%)	173 (62.2%)
Called 911	11 (3.0%)	4 (4.5%)	7 (2.5%)
Ambulance service	12 (3.3%)	3 (3.4%)	9 (3.2%)
Doctor's office	26 (7.1%)	2 (2.2%)	24 (8.6%)
Medical specialist	11 (3.0%)	4 (4.5%)	7 (2.5%)
ER	29 (7.9%)	7 (7.9%)	22 (7.9%)
Night at hospital	6 (1.6%)	2 (2.2%)	4 (1.4%)
Surgery	0 (0.0%)	0 (0.0%)	0 (0.0%)
Physical therapy	24 (6.5%)	8 (9.0%)	16 (5.8%)
Other	21 (5.7%)	5 (5.6%)	16 (5.8%)

Table 16. Del Norte County, CA, participants' fall history separated by rural and urban clusters. * Denotes number of falls is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions. † Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Fall History	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Fall history (n)	146	51	95
Non-faller	86 (58.9%)	30 (58.8%)	56 (58.9%)
Faller	60 (41.1%)	21 (41.2%)	39 (41.1%)
Number of falls*	1.2 \pm 2.6	0.9 \pm 1.5	1.3 \pm 3.0
Injured by a fall (n)	60	21	39
No	8 (13.3%)	1 (4.8%)	7 (17.9%)
Yes	52 (86.7%)	20 (95.2%)	32 (82.1%)
Type of injury (n)†	93	32	61
None	7 (7.5%)	1 (3.1%)	6 (9.8%)
Dislocation	2 (2.2%)	1 (3.1%)	1 (1.6%)
Head/Brain	4 (4.3%)	1 (3.1%)	3 (4.9%)
Bruises	34 (36.6%)	11 (34.4%)	23 (37.7%)
Sprain/ligament	9 (9.7%)	3 (9.4%)	6 (9.8%)
Spinal	2 (2.2%)	1 (3.1%)	1 (1.6%)
Hemorrhage	0 (0.0%)	0 (0.0%)	0 (0.0%)
Cuts/abrasions	22 (23.7%)	10 (31.3%)	12 (19.7%)
Broken bones/fractures	7 (7.5%)	2 (6.3%)	5 (8.2%)
Other	6 (6.5%)	2 (6.3%)	4 (6.6%)
Medical services received (n)†	80	28	52
No assistance	44 (55.0%)	15 (53.6%)	29 (55.8%)
Called 911	5 (6.3%)	2 (7.1%)	3 (5.8%)
Ambulance service	4 (5.0%)	2 (7.1%)	2 (3.8%)
Doctor's office	5 (6.3%)	2 (7.1%)	3 (5.8%)
Medical specialist	2 (2.5%)	1 (3.6%)	1 (1.9%)
ER	10 (12.5%)	4 (14.3%)	6 (11.5%)
Night at hospital	2 (2.5%)	0 (0.0%)	2 (3.8%)
Surgery	0 (0.0%)	0 (0.0%)	0 (0.0%)
Physical therapy	6 (7.5%)	2 (7.1%)	4 (7.7%)
Other	2 (2.5%)	0 (0.0%)	2 (3.8%)

Table 17. Humboldt County, CA, participants' fall circumstance of their most recent fall in the past 12 months separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Fall Circumstance	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Fall location (n)*	486	104	382
Outdoors	128 (26.3%)	37 (35.6%)	91 (23.8%)
Home yard	55 (11.3%)	16 (15.4%)	39 (10.2%)
Street curb	24 (4.9%)	5 (4.8%)	19 (5.0%)
Sidewalk	18 (3.7%)	1 (1.0%)	17 (4.5%)
Parking lot	17 (3.5%)	4 (3.8%)	13 (3.4%)
Outdoor stairs	18 (3.7%)	2 (1.9%)	16 (4.2%)
Indoors	57 (11.7%)	10 (9.6%)	47 (12.3%)
Bedroom	24 (4.9%)	3 (2.9%)	21 (5.5%)
Bathroom	23 (4.7%)	4 (3.8%)	19 (5.0%)
Kitchen	19 (3.9%)	1 (1.0%)	18 (4.7%)
Living room	30 (6.2%)	7 (6.7%)	23 (6.0%)
Inside stairs	16 (3.3%)	6 (5.8%)	10 (2.6%)
Hallway	5 (1.0%)	1 (1.0%)	4 (1.0%)
Other	52 (10.7%)	7 (6.7%)	45 (11.8%)
Time of fall (n)	261	64	197
Night	7 (2.7%)	3 (4.7%)	4 (2.0%)
Morning	64 (24.5%)	12 (18.8%)	52 (26.4%)
Afternoon	148 (56.7%)	40 (62.5%)	108 (54.8%)
Evening	42 (16.1%)	9 (14.1%)	33 (16.8%)
Fall direction (n)*	313	76	237
Straight down	50 (16.0%)	10 (13.2%)	40 (16.9%)
Forward	114 (36.4%)	25 (32.9%)	89 (37.6%)
Backward	54 (17.3%)	11 (14.5%)	43 (18.1%)
Sideways	82 (26.2%)	30 (39.5%)	52 (21.9%)
Unable to recall	13 (4.2%)	0 (0.0%)	13 (5.5%)

Table 18. Del Norte County, CA, participants' fall circumstance of their most recent fall in the past 12 months separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Fall Circumstance	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Fall location (n)*	113	35	78
Outdoors	23 (20.4%)	7 (20.0%)	16 (20.5%)
Home yard	15 (13.3%)	6 (17.1%)	9 (11.5%)
Street curb	5 (4.4%)	2 (5.7%)	3 (3.8%)
Sidewalk	3 (2.7%)	2 (5.7%)	1 (1.3%)
Parking lot	1 (0.9%)	1 (2.9%)	0 (0.0%)
Outdoor stairs	9 (8.0%)	4 (11.4%)	5 (6.4%)
Indoors	15 (13.3%)	3 (8.6%)	12 (15.4%)
Bedroom	4 (3.5%)	2 (5.7%)	2 (2.6%)
Bathroom	3 (2.7%)	0 (0.0%)	3 (3.8%)
Kitchen	7 (6.2%)	2 (5.7%)	5 (6.4%)
Living room	14 (12.4%)	4 (11.4%)	10 (12.8%)
Inside stairs	1 (0.9%)	0 (0.0%)	1 (1.3%)
Hallway	3 (2.7%)	0 (0.0%)	3 (3.8%)
Other	10 (8.8%)	2 (5.7%)	8 (10.3%)
Time of fall (n)	53	20	33
Night	2 (3.8%)	1 (5.0%)	1 (3.0%)
Morning	21 (39.6%)	7 (35.0%)	14 (42.4%)
Afternoon	23 (43.4%)	9 (45.0%)	14 (42.4%)
Evening	7 (13.2%)	3 (15.0%)	4 (12.1%)
Fall direction (n)*	67	22	45
Straight down	9 (13.4%)	4 (18.2%)	5 (11.1%)
Forward	23 (34.3%)	5 (22.7%)	18 (40.0%)
Backward	9 (13.4%)	4 (18.2%)	5 (11.1%)
Sideways	23 (34.3%)	8 (36.4%)	15 (33.3%)
Unable to recall	3 (4.5%)	1 (4.5%)	2 (4.4%)

Table 19. Humboldt County, CA, participants' fall circumstance. Reasons for their most recent fall in the past 12 months separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † LOC = Loss of consciousness.

Fall Circumstance	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Reasons for fall (n)*	472	110	362
Tripped	124 (26.3%)	28 (25.5%)	96 (26.5%)
Slipped	1 (0.2%)	0 (0.0%)	1 (0.3)
Misplaced step	71 (15.0%)	17 (15.5%)	54 (14.9%)
Loss of balance	103 (21.8%)	21 (19.1%)	82 (22.7%)
Legs gave away	34 (7.2%)	9 (8.2%)	25 (6.9%)
Medications	2 (0.4%)	0 (0.0%)	2 (0.6%)
Alcohol	3 (0.6%)	1 (0.9%)	2 (0.6%)
Sparse/no lighting	11 (2.3%)	3 (2.7%)	8 (2.2%)
Fainted	3 (0.6%)	1 (0.9%)	2 (0.6%)
Felt dizzy	17 (3.6%)	4 (3.6%)	13 (3.6%)
Fell out of bed	4 (0.8)	1 (0.9%)	3 (0.8%)
LOC†	6 (1.3%)	2 (1.8%)	4 (1.1%)
Got knocked over	1 (0.2%)	1 (0.9%)	0 (0.0%)
Inattentive	50 (10.6%)	13 (11.8%)	37 (10.2%)
Other	42 (8.9%)	9 (8.2%)	33 (9.1%)

Table 20. Del Norte County, CA, participants' fall circumstance. Reasons for their most recent fall in the past 12 months separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † LOC = Loss of consciousness.

Fall Circumstance	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Reasons for fall (n)*	99	29	70
Tripped	24 (24.2%)	11 (37.9%)	13 (18.6%)
Slipped	0 (0.0%)	0 (0.0%)	0 (0.0%)
Misplaced step	13 (13.1%)	3 (10.3%)	10 (14.3%)
Loss of balance	19 (19.2%)	4 (13.8%)	15 (21.4%)
Legs gave away	11 (11.1%)	2 (6.9%)	9 (12.9%)
Medications	0 (0.0%)	0 (0.0%)	0 (0.0%)
Alcohol	2 (2.0%)	1 (3.4%)	1 (1.4%)
Sparse/no lighting	1 (1.0%)	0 (0.0%)	1 (1.4%)
Fainted	3 (3.0%)	1 (3.4%)	2 (2.9%)
Felt dizzy	6 (6.1%)	0 (0.0%)	6 (8.6%)
Fell out of bed	1 (1.0%)	1 (3.4%)	0 (0.0%)
LOC†	1 (1.0%)	0 (0.0%)	1 (1.4%)
Got knocked over	0 (0.0%)	0 (0.0%)	0 (0.0%)
Inattentive	13 (13.1%)	5 (17.2%)	8 (11.4%)
Other	5 (5.1%)	1 (3.4%)	4 (5.7%)

Table 21. Humboldt County, CA, participants' fall circumstance. Activity leading to their most recent fall in the past 12 months separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Fall Circumstance	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Activity leading to fall (n)*	513	105	408
Sitting	26 (5.1%)	4 (3.8%)	22 (5.4%)
Lying down	3 (0.6%)	1 (1.0%)	2 (0.5%)
Standing	38 (7.4%)	5 (4.8%)	33 (8.1%)
Cooking	4 (0.8%)	0 (0.0%)	4 (1.0%)
Eating	1 (0.2%)	0 (0.0%)	1 (0.2%)
Reaching	20 (3.9%)	4 (3.8%)	16 (3.9%)
Bathing	5 (1.0%)	1 (1.0%)	4 (1.0%)
Bending	11 (2.1%)	1 (1.0%)	10 (2.5%)
Using restroom	14 (2.7%)	2 (1.9%)	12 (2.9%)
Changing position	23 (4.5%)	5 (4.8%)	18 (4.4%)
Using a stool/ladder	4 (0.8%)	0 (0.0%)	4 (1.0%)
Gardening	28 (5.5%)	7 (6.7%)	21 (5.1%)
Home improvements	6 (1.2%)	0 (0.0%)	6 (1.5%)
Going up the stairs	15 (2.9%)	0 (0.0%)	15 (3.7%)
Going down the stairs	27 (5.3%)	4 (3.8%)	23 (5.6%)
Sitting down	8 (1.6%)	0 (0.0%)	8 (2.0%)
Getting up from sitting	12 (2.3%)	2 (1.9%)	10 (2.5%)
Playing sports	4 (0.8%)	1 (1.0%)	3 (0.7%)
Walking on level ground	60 (11.7%)	13 (12.4%)	47 (11.5%)
Walking on uneven ground	72 (14.0%)	23 (21.9%)	49 (12.0%)
Rushing/hurrying	47 (9.2%)	13 (12.4%)	34 (8.3%)
Running	5 (1.0%)	1 (1.0%)	4 (1.0%)
Hiking	9 (1.8%)	0 (0.0%)	9 (2.2%)
Walking a pet	15 (2.9%)	3 (2.9%)	12 (2.9%)
Turning around	20 (3.9%)	4 (3.8%)	16 (3.9%)
Carrying heavy/bulky items	22 (4.3%)	7 (6.7%)	15 (3.7%)
Other	14 (2.7%)	4 (3.8%)	10 (2.5%)

Table 22. Del Norte County, CA, participants' fall circumstance. Activity leading to their most recent fall in the past 12 months separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Fall Circumstance	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Activity leading to fall (n)*	114	34	80
Sitting	4 (3.5%)	2 (5.9%)	2 (2.5%)
Lying down	1 (0.9%)	0 (0.0%)	1 (1.3%)
Standing	11 (9.6%)	1 (2.9%)	10 (12.5%)
Cooking	0 (0.0%)	0 (0.0%)	0 (0.0%)
Eating	0 (0.0%)	0 (0.0%)	0 (0.0%)
Reaching	7 (6.1%)	1 (2.9%)	6 (7.5%)
Bathing	1 (0.9%)	0 (0.0%)	1 (1.3%)
Bending	1 (0.9%)	0 (0.0%)	1 (1.3%)
Using restroom	2 (1.8%)	1 (2.9%)	1 (1.3%)
Changing position	6 (5.3%)	1 (2.9%)	5 (6.3%)
Using a stool/ladder	2 (1.8%)	0 (0.0%)	2 (2.5%)
Gardening	4 (3.5%)	3 (8.8%)	1 (1.3%)
Home improvements	1 (0.9%)	1 (2.9%)	0 (0.0%)
Going up the stairs	6 (5.3%)	1 (2.9%)	5 (6.3%)
Going down the stairs	6 (5.3%)	4 (11.8%)	2 (2.5%)
Sitting down	1 (0.9%)	1 (2.9%)	0 (0.0%)
Getting up from sitting	2 (1.8%)	1 (2.9%)	1 (1.3%)
Playing sports	1 (0.9%)	0 (0.0%)	1 (1.3%)
Walking on level ground	16 (14.0%)	6 (17.6%)	11 (12.5%)
Walking on uneven ground	15 (13.2%)	4 (11.8%)	11 (13.8%)
Rushing/hurrying	6 (5.3%)	1 (2.9%)	5 (6.3%)
Running	1 (0.9%)	0 (0.0%)	1 (1.3%)
Hiking	1 (0.9%)	0 (0.0%)	1 (1.3%)
Walking a pet	3 (2.6%)	1 (2.9%)	2 (2.5%)
Turning around	7 (6.1%)	1 (2.9%)	6 (7.5%)
Carrying heavy/bulky items	6 (5.3%)	2 (5.9%)	4 (5.0%)
Other	3 (2.6%)	2 (5.9%)	1 (1.3%)

Table 23. Humboldt County, CA participants' intrinsic risk factors separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes number of falls is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions. † BMI = Body Mass Index. FOF = Fear of falling. ADL = Activities of Daily Living. IADL = Instrumental Activities of Daily Living.

Intrinsic Risk Factor	Humboldt County (N = 615)	Rural Non-Fallers (n= 60)	Rural Fallers (n= 70)	Urban Non-Fallers (n= 260)	Urban Fallers (n= 225)
BMI*	27.0 \pm 7.6	27.6 \pm 5.6	27.4 \pm 7.1	26.5 \pm 8.2	27.2 \pm 7.5
Fear of falling (n)	610	59	68	259	224
Always	49 (8.0%)	0 (0.0%)	7 (10.3%)	10 (3.9%)	32 (14.3%)
Often	64 (10.5%)	2 (3.4%)	9 (13.2%)	20 (7.7%)	33 (14.7%)
Sometimes	341 (55.9%)	34 (57.6%)	37 (54.4%)	149 (57.5%)	121 (54.0%)
Never	156 (25.6%)	23 (39.0%)	15 (22.1%)	80 (30.9%)	38 (17.0%)
Activity restriction from FOF† (n)	607	60	68	257	222
Always	25 (4.1%)	0 (0.0%)	3 (4.4%)	4 (1.6%)	18 (8.1%)
Often	54 (8.9%)	4 (6.7%)	11 (16.2%)	16 (6.2%)	23 (10.4%)
Sometimes	241 (39.7%)	19 (31.7%)	21 (30.9%)	100 (38.9%)	101 (45.5%)
Never	287 (47.3%)	37 (61.7%)	33 (48.5%)	137 (53.3%)	80 (36.0%)
ADL† restriction (n)	612	60	69	259	224
Always	14 (2.3%)	0 (0.0%)	1 (1.4%)	1 (0.4%)	12 (5.4%)
Often	15 (2.5%)	1 (1.7%)	3 (4.3%)	4 (1.5%)	7 (3.1%)
Sometimes	29 (4.7%)	0 (0.0%)	6 (8.7%)	7 (2.7%)	16 (7.1%)
Never	554 (90.5%)	59 (98.3%)	59 (85.5%)	247 (95.4%)	189 (84.4%)
IADL† restriction (n)	612	59	70	259	224
Always	37 (6.0%)	0 (0.0%)	4 (5.7%)	9 (3.5%)	24 (10.7%)
Often	31 (5.1%)	1 (1.7%)	4 (5.7%)	10 (3.9%)	16 (7.1%)
Sometimes	117 (19.1%)	5 (8.5%)	15 (21.4%)	48 (18.5%)	49 (21.9%)
Never	427 (69.8%)	53 (89.8%)	47 (67.1%)	192 (74.1%)	135 (60.3%)
Chronic condition (n)	611	58	70	258	225
No	134 (21.9%)	18 (31.0%)	16 (22.9%)	58 (22.5%)	42 (18.7%)
Yes	477 (78.1%)	40 (69.0%)	54 (77.1%)	200 (77.5%)	183 (81.3%)

Table 24. Del Norte County, CA, participants' intrinsic risk factors separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes number of falls is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions. † BMI = Body Mass Index. FOF = Fear of falling. ADL = Activities of Daily Living. IADL = Instrumental Activities of Daily Living.

Intrinsic Risk Factor	Del Norte (N =147)	Rural Non- Fallers (n= 60)	Rural Fallers (n= 70)	Urban Non-Fallers (n= 260)	Urban Fallers (n= 225)
BMI*	27.0 \pm 7.6	27.6 \pm 5.6	27.4 \pm 7.1	26.5 \pm 8.2	27.2 \pm 7.5
Fear of falling (n)	610	59	68	259	224
Always	49 (8.0%)	0 (0.0%)	7 (10.3%)	10 (3.9%)	32 (14.3%)
Often	64 (10.5%)	2 (3.4%)	9 (13.2%)	20 (7.7%)	33 (14.7%)
Sometimes	341 (55.9%)	34 (57.6%)	37 (54.4%)	149 (57.5%)	121 (54.0%)
Never	156 (25.6%)	23 (39.0%)	15 (22.1%)	80 (30.9%)	38 (17.0%)
Activity restriction from FOF† (n)	607	60	68	257	222
Always	25 (4.1%)	0 (0.0%)	3 (4.4%)	4 (1.6%)	18 (8.1%)
Often	54 (8.9%)	4 (6.7%)	11 (16.2%)	16 (6.2%)	23 (10.4%)
Sometimes	241 (39.7%)	19 (31.7%)	21 (30.9%)	100 (38.9%)	101 (45.5%)
Never	287 (47.3%)	37 (61.7%)	33 (48.5%)	137 (53.3%)	80 (36.0%)
ADL† restriction (n)	612	60	69	259	224
Always	14 (2.3%)	0 (0.0%)	1 (1.4%)	1 (0.4%)	12 (5.4%)
Often	15 (2.5%)	1 (1.7%)	3 (4.3%)	4 (1.5%)	7 (3.1%)
Sometimes	29 (4.7%)	0 (0.0%)	6 (8.7%)	7 (2.7%)	16 (7.1%)
Never	554 (90.5%)	59 (98.3%)	59 (85.5%)	247 (95.4%)	189 (84.4%)
IADL† restriction (n)	612	59	70	259	224
Always	37 (6.0%)	0 (0.0%)	4 (5.7%)	9 (3.5%)	24 (10.7%)
Often	31 (5.1%)	1 (1.7%)	4 (5.7%)	10 (3.9%)	16 (7.1%)
Sometimes	117 (19.1%)	5 (8.5%)	15 (21.4%)	48 (18.5%)	49 (21.9%)
Never	427 (69.8%)	53 (89.8%)	47 (67.1%)	192 (74.1%)	135 (60.3%)
Chronic condition (n)	611	58	70	258	225
No	134 (21.9%)	18 (31.0%)	16 (22.9%)	58 (22.5%)	42 (18.7%)
Yes	477 (78.1%)	40 (69.0%)	54 (77.1%)	200 (77.5%)	183 (81.3%)

Table 25. Humboldt County, CA, participants with chronic conditions separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † COPD = Chronic obstructive pulmonary disease. OH = Orthostatic hypotension. LOC = Loss of consciousness. UI = Urinary incontinence. ‡ = Arthritis includes Osteoarthritis.

Intrinsic Risk Factor	Humboldt (N = 615)	Rural Non- Fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-Fallers (n = 260)	Urban Fallers (n = 225)
Chronic Conditions (n)*	1390	38	50	192	179
Alzheimer's	7 (0.5%)	0 (0.0%)	1 (2.0%)	1 (0.5%)	5 (2.8%)
COPD†	37 (2.7%)	6 (15.8%)	4 (8.0%)	15 (7.8%)	12 (6.7%)
Cancer	53 (3.8%)	6 (15.8%)	4 (8.0%)	24 (12.5%)	19 (10.6%)
Cardiovascular	99 (7.1%)	7 (18.4%)	8 (16.0%)	40 (20.8%)	44 (24.6%)
Deafness	23 (1.7%)	2 (5.3%)	3 (6.0%)	8 (4.2%)	10 (5.6%)
Dementia	13 (0.9%)	1 (2.6%)	2 (4.0%)	2 (1.0%)	8 (4.5%)
Depression	85 (6.1%)	2 (5.3%)	7 (14.0%)	24 (12.5%)	52 (29.1%)
Diabetes	131 (9.4%)	4 (10.5%)	12 (24.0%)	29 (15.1%)	31 (17.3%)
Epilepsy	6 (0.4%)	0 (0.0%)	0 (0.0%)	4 (2.1%)	2 (1.1%)
Dizziness/vertigo	59 (4.2%)	7 (18.4%)	3 (6.0%)	22 (11.5%)	27 (15.1%)
Stroke	18 (1.3%)	1 (2.6%)	1 (2.0%)	5 (2.6%)	11 (6.1%)
Hypertension	173 (12.4%)	15 (39.5%)	16 (32.0%)	80 (41.7%)	62 (34.6%)
Neuropathy	85 (6.1%)	4 (10.5%)	7 (14.0%)	35 (18.2%)	39 (21.8%)
OH†	15 (1.1%)	0 (0.0%)	0 (0.0%)	5 (2.6%)	10 (5.6%)
Arthritis‡	236 (17.0%)	18 (47.4%)	18 (36.0%)	98 (51.0%)	102 (57.0%)
Osteoporosis	95 (6.8%)	5 (13.2%)	7 (14.0%)	41 (21.4%)	42 (23.5%)
Sleeping disorders	114 (8.2%)	7 (18.4%)	10 (20.0%)	39 (20.3%)	58 (32.4%)
Syncope/ LOC†	33 (2.4%)	1 (2.6%)	2 (4.0%)	9 (4.7%)	21 (11.7%)
UI†	108 (7.8%)	7 (18.4%)	10 (20.0%)	39 (20.3%)	52 (29.1%)

Table 26. Del Norte County, CA, participants with chronic conditions separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † COPD = Chronic obstructive pulmonary disease. OH = Orthostatic hypotension. LOC = Loss of consciousness. UI = Urinary incontinence. ‡ = Arthritis includes Osteoarthritis.

Intrinsic Risk Factor	Del Norte (N =147)	Rural Non-Fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-Fallers (n = 56)	Urban Fallers (n = 39)
Chronic Conditions (n)*	371	21	17	41	33
Alzheimer's	1 (0.3%)	0 (0.0%)	1 (5.9%)	0 (0.0%)	0 (0.0%)
COPD†	16 (4.3%)	5 (23.8%)	1 (5.9%)	7 (17.1%)	3 (9.1%)
Cancer	10 (2.7%)	2 (9.5%)	1 (5.9%)	2 (4.9%)	5 (15.2%)
Cardiovascular	32 (8.6%)	5 (23.8%)	5 (29.4%)	15 (36.6%)	7 (21.2%)
Deafness	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.0%)
Dementia	4 (1.1%)	0 (0.0%)	1 (5.9%)	0 (0.0%)	3 (9.1%)
Depression	26 (7.0%)	2 (9.5%)	5 (29.4%)	9 (22.0%)	10 (30.3%)
Diabetes	26 (7.0%)	5 (23.8%)	2 (11.8%)	7 (17.1%)	11 (33.3%)
Epilepsy	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Dizziness/vertigo	23 (6.2%)	3 (14.3%)	4 (23.5%)	7 (17.1%)	9 (27.3%)
Stroke	9 (2.4%)	1 (4.8%)	2 (11.8%)	2 (4.9%)	4 (12.1%)
Hypertension	48 (12.9%)	8 (38.1%)	6 (35.3%)	18 (43.9%)	16 (48.5%)
Neuropathy	22 (5.9%)	1 (4.8%)	2 (11.8%)	10 (24.4%)	9 (27.3%)
OH*	2 (0.5%)	1 (4.8%)	0 (0.0%)	0 (0.0%)	1 (3.0%)
Arthritis‡	65 (17.5%)	12 (57.1%)	9 (52.9%)	22 (53.7%)	21 (63.6%)
Osteoporosis	24 (6.5%)	5 (23.8%)	2 (11.8%)	12 (29.3%)	5 (15.2%)
Sleeping disorders	26 (7.0%)	3 (14.3%)	2 (11.8%)	13 (31.7%)	8 (24.2%)
Syncope/ LOC†	6 (1.6%)	1 (4.8%)	1 (5.9%)	1 (2.4%)	3 (9.1%)
UI†	30 (8.1%)	4 (19.0%)	6 (35.3%)	7 (17.1%)	12 (36.4%)

Table 27. Humboldt County, CA, participants who are taking medication for chronic conditions separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † COPD = Chronic obstructive pulmonary disease. OH = Orthostatic hypotension. LOC = Loss of consciousness. UI = Urinary incontinence. ‡ = Arthritis includes Osteoarthritis.

Chronic Condition	Humboldt (N =615)	Rural Non-Fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-Fallers (n = 260)	Urban Fallers (n = 225)
Med intake for (n)*	1028	30	42	166	157
Alzheimer's	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)
COPD†	31 (3.0%)	5 (16.7%)	4 (9.5%)	13 (7.8%)	9 (5.7%)
Cancer	31 (3.0%)	5 (16.7%)	1 (2.4%)	14 (8.4%)	11 (7.0%)
Cardiovascular	89 (8.7%)	6 (20.0%)	8 (19.0%)	38 (22.9%)	37 (23.6%)
Deafness	23 (2.2%)	2 (6.7%)	3 (7.1%)	8 (4.2%)	10 (6.4%)
Dementia	6 (0.6%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	5 (3.2%)
Depression	78 (7.6%)	2 (6.7%)	7 (16.7%)	23 (13.9%)	46 (29.3%)
Diabetes	114 (11.1%)	3 (10.0%)	10 (23.8%)	26 (15.7%)	20 (12.7%)
Epilepsy	4 (0.4%)	0 (0.0%)	0 (0.0%)	2 (1.2%)	2 (1.3%)
Dizziness/vertigo	30 (2.9%)	2 (6.7%)	2 (4.8%)	13 (7.8%)	13 (8.3%)
Stroke	11 (1.1%)	0 (0%)	1 (2.4%)	4 (2.4%)	6 (3.8%)
Hypertension	163 (15.9%)	13 (43.3%)	14 (33.3%)	78 (47.0%)	58 (36.9%)
Neuropathy	57 (5.5%)	1 (3.3%)	6 (14.3%)	25 (15.1%)	25 (15.9%)
OH†	10 (1.0%)	0 (0.0%)	0 (0.0%)	4 (2.4%)	6 (3.8%)
Arthritis‡	161 (15.7%)	10 (33.3%)	12 (28.6%)	72 (43.4%)	67 (42.7%)
Osteoporosis	61 (5.9%)	3 (10.0%)	4 (9.5%)	27 (16.3%)	27 (17.2%)
Sleeping disorders	84 (8.2%)	5 (16.7%)	6 (14.3%)	32 (19.3%)	41 (26.1%)
Syncope/LOC†	10 (1.0%)	0 (0.0%)	0 (0.0%)	3 (1.8%)	7 (4.5%)
UI†	64 (6.2%)	2 (6.7%)	7 (16.7%)	27 (16.3%)	28 (17.9%)

Table 28. Del Norte County, CA, participants who are taking medication for chronic conditions separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † COPD = Chronic obstructive pulmonary disease. OH = Orthostatic hypotension. LOC = Loss of consciousness. UI = Urinary incontinence. ‡ = Arthritis includes Osteoarthritis.

Chronic Condition	Del Norte (N =147)	Rural Non-Fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-Fallers (n = 56)	Urban Fallers (n = 39)
Med intake for (n)*	286	19	15	36	29
Alzheimer's	1 (0.3%)	0 (0.0%)	1 (6.7%)	0 (0.0%)	0 (0.0%)
COPD†	16 (5.6%)	5 (26.3%)	1 (6.7%)	7 (19.4%)	3 (10.3%)
Cancer	6 (2.1%)	2 (10.5%)	0 (0.0%)	1 (2.8%)	3 (10.3%)
Cardiovascular	26 (9.1%)	4 (21.1%)	3 (20.0%)	13 (36.1%)	6 (20.7%)
Deafness	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.4%)
Dementia	2 (0.7%)	0 (0%)	1 (6.7%)	0 (0.0%)	1 (3.4%)
Depression	23 (8.0%)	1 (5.3%)	5 (33.3%)	7 (19.4%)	10 (34.5%)
Diabetes	24 (8.4%)	4 (21.1%)	2 (13.2%)	7 (19.4%)	10 (34.5%)
Epilepsy	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	(0.0%)
Dizziness/vertigo	12 (4.2%)	2 (10.5%)	2 (13.3%)	3 (8.3%)	5 (17.2%)
Stroke	3 (1.0%)	0 (0.0%)	0 (0%)	1 (2.8%)	2 (6.9%)
Hypertension	45 (15.7%)	7 (36.8%)	6 (40.0%)	17 (47.2%)	15 (51.7%)
Neuropathy	14 (4.9%)	0 (0.0%)	1 (6.7%)	8 (22.2%)	5 (17.2%)
OH†	2 (0.7%)	1 (5.3%)	0 (0.0%)	0 (0.0%)	1 (3.4%)
Arthritis‡	49 (17.1%)	8 (42.1%)	6 (40.0%)	19 (52.8%)	15 (51.7%)
Osteoporosis	17 (5.9%)	3 (15.8%)	2 (13.3%)	9 (25.0%)	3 (10.3%)
Sleeping disorders	21 (7.3%)	2 (10.5%)	2 (13.3%)	10 (27.8%)	7 (24.1%)
Syncope/LOC†	3 (1.0%)	0 (0.0%)	1 (6.7%)	1 (2.8%)	1 (3.4%)
UI†	21 (7.3%)	2 (10.5%)	4 (26.7%)	5 (13.9%)	10 (34.5%)

Table 29. Humboldt County, CA, participants who are taking prescribed medications separated by rural and urban clusters. * Denotes number of falls is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions.

Medication Intake	Humboldt (N = 615)	Rural Non-Fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-Fallers (n = 260)	Urban Fallers (n = 225)
Prescribed med (n)	613	60	70	259	224
No	96 (15.7%)	16 (26.7%)	15 (21.4%)	37 (14.3%)	28 (12.5%)
Yes	517 (84.3%)	44 (73.3%)	55 (78.6%)	222 (85.7%)	196 (87.5%)
Sleep med (n)	515	44	55	220	196
No	430 (83.5%)	38 (86.4%)	44 (80.0%)	189 (85.9%)	159 (81.1%)
Yes	85 (16.5%)	6 (13.6%)	11 (20.0%)	31 (14.1%)	37 (18.9%)
Mood med (n)	512	44	54	220	194
No	397 (77.5%)	37 (84.1%)	43 (79.6%)	185 (84.1%)	132 (68.0%)
Yes	115 (22.5%)	7 (15.9%)	11 (20.4%)	35 (15.9%)	62 (32.0%)
# of meds*	4.0 \pm 2.8	3.3 \pm 2.3	3.9 \pm 2.4	3.6 \pm 2.6	4.6 \pm 3.0

Table 30. Del Norte County, CA, participants who are taking prescribed medications separated by rural and urban clusters. * Denotes number of falls is displayed as mean \pm SD. All other values show the number and percentage of total participants who answered the questions.

Medication Intake	Del Norte (N = 147)	Rural Non-Fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-Fallers (n = 56)	Urban Fallers (n = 39)
Prescribed med (n)	143	30	21	54	37
No	17 (11.9%)	6 (20.0%)	3 (14.3%)	6 (11.1%)	2 (5.4%)
Yes	126 (88.1%)	24 (80.0%)	18 (85.7%)	48 (88.9%)	35 (94.6%)
Sleep med (n)	122	23	18	46	34
No	111 (91.0%)	22 (95.7%)	17 (94.4%)	41 (89.1%)	30 (88.2%)
Yes	11 (9.0%)	1 (4.3%)	1 (5.6%)	5 (10.9%)	4 (11.8%)
Mood med (n)	124	24	18	46	35
No	96 (77.4%)	21 (87.5%)	12 (66.7%)	37 (80.4%)	25 (71.4%)
Yes	28 (22.6%)	3 (12.5%)	6 (33.3%)	9 (19.6%)	10 (28.6%)
# of meds*	4.6 \pm 3.9	3.7 \pm 1.8	3.9 \pm 2.7	4.7 \pm 3.9	5.4 \pm 5.2

Table 31. Humboldt County, CA, participants with pain separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † ARFP = Activity restriction from pain.

Intrinsic Risk Factor	Humboldt (N = 615)	Rural Non-Fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-Fallers (n = 260)	Urban Fallers (n = 225)
Pain (n)	609	59	70	256	224
No	207 (34.0%)	30 (50.8%)	21 (30.0%)	92 (35.9%)	64 (28.6%)
Yes	402 (66.0%)	29 (49.2%)	49 (70.0%)	164 (64.1%)	160 (71.4%)
Pain Location (n)*	1056	29	48	164	159
Hip	157 (14.9%)	10 (34.5%)	22 (45.8%)	65 (39.6%)	60 (37.7%)
Back	197 (18.7%)	14 (48.3%)	21 (43.8%)	80 (48.8%)	82 (51.6%)
Foot	125 (11.8%)	5 (17.2%)	13 (27.1%)	54 (32.9%)	53 (33.3%)
Hands	100 (9.5%)	4 (13.8%)	12 (25.0%)	45 (27.4%)	39 (24.5%)
Knee	157 (14.9%)	15 (51.7%)	21 (43.8%)	58 (35.4%)	63 (39.6%)
Wrist	52 (4.9%)	4 (13.8%)	6 (12.5%)	19 (11.6%)	23 (14.5%)
Shoulders	115 (10.9%)	13 (44.8%)	14 (29.2%)	47 (28.7%)	41 (25.8%)
Neck	98 (9.3%)	9 (31.0%)	13 (27.1%)	39 (23.8%)	37 (23.3%)
Other	55 (5.2%)	3 (10.3%)	5 (10.4%)	23 (14.0%)	24 (15.1%)
ARFP† (n)	400	29	48	163	160
Always	2 (0.5%)	0 (0.0%)	2 (4.2%)	0 (0%)	0 (0.0%)
Often	37 (9.3%)	2 (6.9%)	7 (14.6%)	11 (6.7%)	17 (10.6%)
Sometimes	192 (48.0%)	14 (48.3%)	28 (58.3%)	73 (44.8%)	77 (48.1%)
Never	169 (42.3%)	13 (44.8%)	11 (22.9%)	79 (48.5%)	66 (41.3%)
Pain medication (n)	394	28	47	160	159
No	199 (50.5%)	11 (39.3%)	28 (59.6%)	88 (55.0%)	72 (45.3%)
Yes	195 (49.5%)	17 (60.7%)	19 (40.4%)	72 (45.0%)	87 (54.7%)

Table 32. Del Norte County, CA, participants with pain separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † ARFP = Activity restriction from pain.

Intrinsic Risk Factor	Del Norte (N = 147)	Rural Non-Fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-Fallers (n = 56)	Urban Fallers (n = 39)
Pain (n)	144	30	20	54	39
No	43 (29.9%)	12 (40.0%)	6 (30.0%)	15 (27.8%)	10 (25.6%)
Yes	101 (70.1%)	18 (60.0%)	14 (70.0%)	39 (72.2%)	29 (74.4%)
Pain Location (n)*	303	18	14	39	29
Hip	46 (15.2%)	9 (50.0%)	8 (57.1%)	18 (46.2%)	10 (34.5%)
Back	64 (21.1%)	10 (55.6%)	8 (57.1%)	24 (61.5%)	21 (72.4%)
Foot	28 (9.2%)	3 (16.7%)	3 (21.4%)	13 (33.3%)	8 (27.6%)
Hands	19 (6.3%)	1 (5.6%)	1 (7.1%)	9 (23.1%)	7 (24.1%)
Knee	45 (14.9%)	5 (27.8%)	6 (42.9%)	18 (46.2%)	16 (55.2%)
Wrist	14 (4.6%)	1 (5.6%)	1 (7.1%)	6 (15.4%)	5 (17.2%)
Shoulders	34 (11.2%)	5 (27.8%)	5 (35.7%)	13 (33.3%)	11 (37.9%)
Neck	32 (10.6%)	7 (38.9%)	2 (14.3%)	14 (35.9%)	9 (31.0%)
Other	21 (6.9%)	3 (16.7%)	2 (14.3%)	8 (20.5%)	8 (27.6%)
ARFP† (n)	100	18	14	39	28
Always	4 (4.0%)	1 (5.6%)	0 (0.0%)	2 (5.1%)	1 (3.6%)
Often	9 (9.0%)	0 (0.0%)	2 (14.3%)	3 (7.7%)	3 (10.7%)
Sometimes	47 (47.0%)	5 (27.8%)	6 (42.9%)	19 (48.7%)	17 (60.7%)
Never	40 (40.0%)	12 (66.7%)	6 (42.9%)	15 (38.5%)	7 (25.0%)
Pain medication (n)	98	18	14	37	29
No	56 (57.1%)	14 (77.8%)	9 (64.3%)	22 (59.5%)	11 (37.9%)
Yes	42 (42.9%)	4 (22.2%)	5 (35.7%)	15 (40.5%)	18 (62.1%)

Table 33. Humboldt County, CA, participants with limitations separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers.

Limitation	Humboldt (N = 615)	Rural Non-Fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-Fallers (n = 260)	Urban Fallers (n = 225)
Walking instability (n)	598	60	66	256	216
Always	28 (4.7%)	0 (0.0%)	2 (3.0%)	6 (2.3%)	20 (9.3%)
Often	52 (8.7%)	2 (3.3%)	12 (18.2%)	15 (5.9%)	23 (10.6%)
Sometimes	234 (39.1%)	17 (28.3%)	24 (36.4%)	97 (37.9%)	96 (44.4%)
Never	284 (47.5%)	41 (68.3%)	28 (42.4%)	138 (53.9%)	77 (35.6%)
Balance instability (n)	607	59	69	257	222
Always	52 (8.6%)	1 (1.7%)	4 (5.8%)	11 (4.3%)	36 (16.2%)
Often	56 (9.2%)	0 (0.0%)	9 (13.0%)	15 (5.8%)	32 (14.4%)
Sometimes	252 (41.5%)	26 (44.1%)	33 (47.8%)	110 (42.8%)	83 (37.4%)
Never	247 (40.7%)	32 (54.2%)	23 (33.3%)	121 (47.1%)	71 (32.0%)
Able to bend, stoop, or kneel without assistance? (n)	609	59	70	257	223
Always	396 (65%)	40 (67.8%)	46 (65.7%)	179 (69.6%)	131 (58.7%)
Often	93 (15.3%)	10 (16.9%)	14 (20.0%)	34 (13.2%)	35 (15.7%)
Sometimes	64 (10.5%)	8 (13.6%)	8 (11.4%)	17 (6.6%)	31 (13.9%)
Never	56 (9.2%)	1 (1.7%)	2 (2.9%)	27 (10.5%)	26 (11.7%)
Able to walk up/downstairs alone? (n)	609	59	69	258	223
Always	511 (83.9%)	57 (96.6%)	57 (82.6%)	218 (84.5%)	179 (80.3%)
Often	31 (5.1%)	0 (0.0%)	6 (8.7%)	13 (5.0%)	12 (5.4%)
Sometimes	25 (4.1%)	2 (3.4%)	3 (4.3%)	10 (3.9%)	10 (4.5%)
Never	42 (6.9%)	0 (0.0%)	3 (4.3%)	17 (6.6%)	22 (9.9%)
Need to use hands or assistance to get up from a chair? (n)	609	59	69	258	223
Always	83 (13.6%)	1 (1.7%)	12 (17.4%)	29 (11.2%)	41 (18.4%)
Often	81 (13.3%)	12 (20.3%)	7 (10.1%)	21 (8.1%)	41 (18.4%)
Sometimes	192 (31.5%)	13 (22.0%)	26 (37.7%)	85 (32.9%)	68 (30.5%)
Never	253 (41.5%)	33 (55.9%)	24 (34.8%)	123 (47.7%)	73 (32.7%)
Use walker/cane or other forms of assistance for mobility? (n)	604	59	70	255	220
Always	51 (8.4%)	0 (0.0%)	9 (12.9%)	16 (6.3%)	26 (11.8%)
Often	35 (5.8%)	0 (0.0%)	6 (8.6%)	9 (3.5%)	20 (9.1%)
Sometimes	99 (16.4%)	6 (10.2%)	8 (11.4%)	35 (13.7%)	50 (22.7%)
Never	419 (69.4%)	53 (89.8%)	47 (67.1%)	195 (76.5%)	124 (56.4%)

Table 34. Del Norte County, CA, participants with limitations separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers.

Limitation	Del Norte (N = 147)	Rural Non-Fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-Fallers (n = 56)	Urban Fallers (n = 39)
Walking instability (n)	142	29	21	53	38
Always	13 (9.2%)	1 (3.4%)	2 (9.5%)	3 (5.7%)	7 (18.4%)
Often	11 (7.7%)	0 (0.0%)	2 (9.5%)	5 (9.4%)	3 (7.9%)
Sometimes	61 (43.0%)	14 (48.3%)	12 (57.1%)	18 (34.0%)	17 (44.7%)
Never	57 (40.1%)	14 (48.3%)	5 (23.8%)	27 (50.9%)	11 (28.9%)
Balance instability (n)	143	30	21	54	38
Always	13 (9.1%)	1 (3.3%)	3 (14.3%)	1 (1.9%)	8 (21.1%)
Often	15 (10.5%)	3 (10.0%)	1 (4.8%)	5 (9.3%)	6 (15.8%)
Sometimes	60 (42.0%)	13 (43.3%)	13 (61.9%)	21 (38.9%)	13 (34.2%)
Never	55 (38.5%)	13 (43.3%)	4 (19.0%)	27 (50.0%)	11 (28.9%)
Able to bend, stoop, or kneel without assistance? (n)	142	30	20	54	37
Always	82 (57.7%)	22 (73.3%)	10 (50.0%)	37 (68.5%)	12 (32.4%)
Often	19 (13.4%)	3 (10.0%)	1 (5.0%)	7 (13.0%)	8 (21.6%)
Sometimes	26 (18.3%)	0 (0.0%)	9 (45.0%)	5 (9.3%)	12 (32.4%)
Never	15 (10.6%)	5 (16.7%)	0 (0.0%)	5 (9.3%)	5 (13.5%)
Able to walk up/downstairs alone? (n)	143	30	21	53	38
Always	108 (75.5%)	29 (96.7%)	14 (66.7%)	42 (79.2%)	23 (60.5%)
Often	16 (11.2%)	0 (0.0%)	4 (19.0%)	4 (7.5%)	8 (21.1%)
Sometimes	13 (9.1%)	0 (0.0%)	2 (9.5%)	7 (13.2%)	3 (7.9%)
Never	6 (4.2%)	1 (3.3%)	1 (4.8%)	0 (0.0%)	4 (10.5%)
Need to use hands or assistance to get up from a chair? (n)	144	30	21	54	38
Always	21 (14.6%)	3 (10.0%)	4 (19.0%)	6 (11.1%)	7 (18.4%)
Often	24 (16.7%)	3 (10.0%)	4 (19.0%)	11 (20.4%)	6 (15.8%)
Sometimes	49 (34.0%)	9 (30.0%)	8 (38.1%)	19 (35.2%)	13 (34.2%)
Never	50 (34.7%)	15 (50.0%)	5 (23.8%)	18 (33.3%)	12 (31.6%)
Use walker/cane or other forms of assistance for mobility? (n)	143	30	21	54	37
Always	18 (12.6%)	2 (6.7%)	4 (19.0%)	4 (7.4%)	7 (18.9%)
Often	4 (2.8%)	0 (0.0%)	0 (0.0%)	3 (5.6%)	1 (2.7%)
Sometimes	24 (16.8%)	2 (6.7%)	5 (23.8%)	7 (13.0%)	10 (27.0%)
Never	97 (67.8%)	26 (86.7%)	12 (57.1%)	40 (74.1%)	19 (51.4%)

Table 35. Humboldt County, CA, participants' physical, muscle, and balance, and flexibility activity according to rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * 2-4 days = 30 min/day, 2-4 times/week. † 5-7 days = 30 min/day, 5-7 days/week. ‡ Muscle activity = Muscle strengthening activity. § Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Behavioral Risk Factor	Humboldt (N = 615)	Rural Non-fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-fallers (n = 260)	Urban Fallers (n = 225)
Physical activity	606	60	70	256	220
Not active	134 (22.1%)	10 (16.7%)	15 (21.4%)	45 (17.6%)	64 (29.1%)
2-4 days*	213 (35.1%)	20 (33.3%)	20 (28.6%)	100 (39.1%)	73 (33.2%)
5-7 days†	259 (42.7%)	30 (50.0%)	35 (50.0%)	111 (43.4%)	83 (37.7%)
Muscle activity‡	601	60	69	252	220
Not active	225 (37.4%)	18 (30.0%)	23 (33.3%)	85 (33.7%)	99 (45.0%)
Once a week	120 (20.0%)	15 (25.0%)	14 (20.3%)	50 (19.8%)	41 (18.6%)
Twice a week	256 (42.6%)	27 (45.0%)	32 (46.4%)	117 (46.4%)	80 (36.4%)
Participate in a balance, flexibility, or local class?§	683	59	69	253	222
Stretching	287 (42.0%)	31 (52.5%)	34 (49.3%)	125 (49.4%)	97 (43.7%)
Balance	63 (9.2%)	2 (3.4%)	5 (7.2%)	27 (10.7%)	29 (13.1%)
Local Class	83 (12.2%)	6 (10.2%)	7 (10.1%)	44 (17.4%)	26 (11.7%)
No	250 (36.6%)	26 (44.1%)	30 (43.5%)	92 (36.4%)	102 (45.9%)

Table 36. Del Norte County, CA, participants' physical, muscle, and balance, and flexibility activity according to rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * 2-4 days = 30 min/day, 2-4 times/week. † 5-7 days = 30 min/day, 5-7 days/week. ‡ Muscle activity = Muscle strengthening activity. § Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Behavioral Risk Factor	Del Norte (N = 147)	Rural Non-fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-fallers (n = 56)	Urban Fallers (n = 39)
Physical activity	144	30	21	54	38
Not active	44 (30.6%)	7 (23.3%)	10 (47.6%)	15 (27.8%)	12 (31.6%)
2-4 days*	46 (31.9%)	12 (40.0%)	5 (23.8%)	17 (31.5%)	11 (28.9%)
5-7 days†	54 (37.5%)	11 (36.7%)	6 (28.6%)	22 (40.7%)	15 (39.5%)
Muscle activity‡	143	30	21	54	37
Not active	77 (53.8%)	12 (40.0%)	15 (71.4%)	26 (48.1%)	23 (62.2%)
Once a week	20 (14.0%)	6 (20.0%)	1 (4.8%)	6 (11.1%)	7 (18.9%)
Twice a week	46 (32.2%)	12 (40.0%)	5 (23.8%)	22 (40.7%)	7 (18.9%)
Participate in a balance, flexibility, or local class? §	151	30	21	53	38
Stretching	53 (35.1%)	10 (33.3%)	8 (38.1%)	21 (39.6%)	14 (36.8%)
Balance	7 (4.6%)	0 (0.0%)	0 (0.0%)	3 (5.7%)	4 (10.5%)
Local Class	3 (2.0%)	1 (3.3%)	0 (0.0%)	2 (3.8%)	0 (0.0%)
No	88 (58.3%)	20 (66.7%)	14 (66.7%)	31 (58.5%)	23 (60.5%)

Table 37. Humboldt County participants' common indoor home hazards separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Extrinsic Risk Factor	Humboldt (N = 615)	Rural Non-fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-fallers (n = 260)	Urban Fallers (n = 225)
Indoor hazards (n)*	1975	51	63	232	198
None	17 (0.9%)	1 (2.0%)	2 (3.2%)	10 (4.3%)	4 (2.0%)
Throw rugs	303 (15.3%)	25 (49.0%)	34 (54.0%)	134 (57.8%)	110 (55.6%)
Slippery surfaces	87 (4.4%)	5 (9.8%)	11 (17.5%)	31 (13.4%)	40 (20.2%)
Loose/worn carpets	39 (2.0%)	7 (13.7%)	7 (11.1%)	12 (5.2%)	13 (6.6%)
Clutter on ground	63 (3.2%)	9 (17.6%)	9 (14.3%)	17 (7.3%)	28 (14.1%)
Cluttered pathways	32 (1.6%)	4 (7.8%)	4 (6.3%)	9 (3.9%)	15 (7.6%)
Staircases w/o railing	40 (2.0%)	3 (5.9%)	11 (17.5%)	13 (5.6%)	13 (6.6%)
Furniture obstacles	20 (1.0%)	3 (5.9%)	3 (4.8%)	3 (1.3%)	11 (5.6%)
Too low/too high toilet height	46 (2.3%)	3 (5.9%)	5 (7.9%)	22 (9.5%)	16 (8.1%)
Too low/too high bed height	30 (1.5%)	2 (3.9%)	1 (1.6%)	16 (6.9%)	11 (5.6%)
Cords on ground	74 (3.7%)	4 (7.8%)	13 (20.6%)	22 (9.5%)	35 (17.7%)
Poor/no lighting around pathways	23 (1.2%)	3 (5.9%)	5 (7.9%)	4 (1.7%)	11 (5.6%)
Pets around feet	228 (11.5%)	21 (41.2%)	27 (42.9%)	92 (39.7%)	88 (44.4%)
Bathtub/ shower without grab bars	261 (13.2%)	30 (58.8%)	41 (65.1%)	101 (43.5%)	89 (44.9%)
Front entrance edge	302 (15.3%)	27 (52.9%)	34 (54.0%)	131 (56.5%)	110 (55.6%)
Bathtub Edge	216 (10.9%)	22 (43.1%)	23 (36.5%)	93 (40.1%)	78 (39.4%)
Hard-to-reach areas	129 (6.5%)	11 (21.6%)	15 (23.8%)	49 (21.1%)	54 (27.3%)
Far away light	31 (1.6%)	3 (5.9%)	4 (6.3%)	12 (5.2%)	12 (6.1%)
Phone not accessible	34 (1.7%)	1 (2.0%)	8 (12.7%)	9 (3.9%)	16 (8.1%)

Table 38. Del Norte County participants' common indoor home hazards separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Extrinsic Risk Factor	Del Norte (N = 147)	Rural Non-fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-fallers (n = 56)	Urban Fallers (n = 39)
Indoor hazards (n)*	490	22	16	48	35
None	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Throw rugs	78 (15.9%)	12 (54.5%)	10 (62.5%)	36 (75.0%)	20 (57.1%)
Slippery surfaces	18 (3.7%)	5 (22.7%)	3 (18.8%)	7 (14.6%)	3 (8.6%)
Loose/worn carpets	15 (3.1%)	2 (9.1%)	2 (12.5%)	6 (12.5%)	5 (14.3%)
Clutter on ground	9 (1.8%)	1 (4.5%)	1 (6.3%)	2 (4.2%)	5 (14.3%)
Clutter ed pathways	12 (2.4%)	3 (13.6%)	4 (25.0%)	3 (6.3%)	2 (5.7%)
Staircases w/o railing	4 (0.8%)	0 (0.0%)	0 (0.0%)	2 (4.2%)	2 (5.7%)
Furniture obstacles	11 (2.2%)	2 (9.1%)	1 (6.3%)	3 (6.3%)	5 (14.3%)
Too low/too high toilet height	17 (3.5%)	3 (13.6%)	0 (0.0%)	6 (12.5%)	7 (20.0%)
Too low/too high bed height	8 (1.6%)	0 (0.0%)	0 (0.0%)	4 (8.3%)	4 (11.4%)
Cords on ground	12 (2.4%)	4 (18.2%)	1 (6.3%)	5 (10.4%)	2 (5.7%)
Poor/no lighting around pathways	7 (1.4%)	0 (0.0%)	0 (0.0%)	3 (6.3%)	4 (11.4%)
Pets around feet	63 (12.9%)	13 (59.1%)	6 (37.5%)	29 (60.4%)	15 (42.9%)
Bathtub/ shower without grab bars	62 (12.7%)	11 (50.0%)	7 (43.8%)	29 (60.4%)	15 (42.9%)
Front entrance edge	66 (13.5%)	8 (36.4%)	12 (75.0%)	30 (62.5%)	16 (45.7%)
Bathtub Edge	60 (12.2%)	11 (50.0%)	10 (62.5%)	25 (52.1%)	14 (40.0%)
Hard-to-reach areas	28 (5.7%)	4 (18.2%)	4 (25.0%)	9 (18.8%)	11 (31.4%)
Far away light	13 (2.7%)	0 (0.0%)	3 (18.8%)	7 (14.6%)	3 (8.6%)
Phone not accessible	7 (1.4%)	0 (0.0%)	2 (12.5%)	2 (4.2%)	3 (8.6%)

Table 39. Humboldt County, CA, outdoor home hazards separated by rural and urban clusters. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Extrinsic Risk Factor	Humboldt (N = 615)	Rural Non- fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-fallers (n = 260)	Urban Fallers (n = 225)
Outdoor hazards (n)*	897	44	61	176	176
None	41 (4.6%)	4 (9.1%)	2 (3.3%)	20 (11.4%)	15 (8.5%)
Slippery walking areas	119 (13.3%)	9 (20.5%)	25 (41.0%)	38 (21.6%)	47 (26.7%)
No Stair railing	136 (15.2%)	16 (36.4%)	21 (34.4%)	53 (30.1%)	46 (26.1%)
Poor/no lighting	89 (9.9%)	14 (31.8%)	15 (24.6%)	27 (15.3%)	33 (18.8%)
Uneven surfaces	213 (23.7%)	24 (54.5%)	37 (60.7%)	64 (36.4%)	88 (50.0%)
Walkways flood	33 (3.7%)	3 (6.8%)	8 (13.1%)	7 (4.0%)	15 (8.5%)
Pets near feet	148 (16.5%)	12 (27.3%)	25 (41.0%)	49 (27.8%)	62 (35.2%)
Items on walkways	86 (9.6%)	8 (18.2%)	18 (29.5%)	24 (13.6%)	36 (20.5%)
Hard-to-reach items	32 (3.6%)	1 (2.3%)	9 (14.8%)	6 (3.4%)	16 (9.1%)

Table 40. Del Norte County, CA, outdoor home hazards separated by rural and urban. Rural and urban clusters separated further by non-fallers and fallers. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Extrinsic Risk Factor	Del Norte (N = 147)	Rural Non-fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-fallers (n = 56)	Urban Fallers (n = 39)
Outdoor hazards (n)*	194	20	11	42	28
None	1 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (3.6%)
Slippery walking areas	26 (13.4%)	7 (35.0%)	3 (27.3%)	11 (26.2%)	5 (17.9%)
No Stair railing	20 (10.3%)	2 (10.0%)	2 (18.2%)	9 (21.4%)	7 (25.0%)
Poor/no lighting	22 (11.3%)	1 (5.0%)	4 (36.4%)	12 (28.6%)	5 (17.9%)
Uneven surfaces	33 (17.0%)	7 (35.0%)	2 (18.2%)	14 (33.3%)	10 (35.7%)
Walkways flood	16 (8.2%)	4 (20.0%)	2 (18.2%)	5 (11.9%)	5 (17.9%)
Pets near feet	40 (20.6%)	8 (40.0%)	3 (27.3%)	20 (47.6%)	9 (32.1%)
Items on walkways	22 (11.3%)	5 (25.0%)	3 (27.3%)	8 (19.0%)	6 (21.4%)
Hard-to-reach items	14 (7.2%)	1 (5.0%)	3 (27.3%)	4 (9.5%)	6 (21.4%)

Table 41. Humboldt County, CA, participants' common footwear worn separated by rural and urban. Rural and urban clusters separated further by non-fallers and fallers. *

Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Extrinsic Risk Factor	Humboldt (N = 615)	Rural Non-fallers (n = 60)	Rural Fallers (n = 70)	Urban Non-fallers (n = 260)	Urban Fallers (n = 225)
Shoe wear (n)*	1168	60	70	259	223
Slippers	210 (18.0%)	18 (30.0%)	25 (35.7%)	89 (34.4%)	78 (35.0%)
Thick soles shoes	293 (25.1%)	30 (50.0%)	29 (41.4%)	112 (43.2%)	122 (54.7%)
Thin soles shoes	339 (29.0%)	36 (60.0%)	39 (55.7%)	150 (57.9%)	114 (51.1%)
Barefoot	105 (9.0%)	16 (26.7%)	17 (24.3%)	42 (16.2%)	30 (13.5%)
Socks w/o shoes	91 (7.8%)	14 (23.3%)	11 (15.7%)	36 (13.9%)	30 (13.5%)
Other	130 (11.1%)	13 (21.7%)	18 (25.7%)	59 (22.8%)	40 (17.9%)

Table 42. Del Norte County, CA, participants' common footwear worn separated by rural and urban. Rural and urban clusters separated further by non-fallers and fallers. *

Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Extrinsic Risk Factor	Del Norte (N = 147)	Rural Non-fallers (n = 30)	Rural Fallers (n = 21)	Urban Non-fallers (n = 56)	Urban Fallers (n = 39)
Shoe wear (n)*	271	30	21	53	39
Slippers	48 (17.7%)	12 (40.0%)	3 (14.3%)	22 (41.5%)	11 (28.2%)
Thick soles shoes	61 (22.5%)	12 (40.0%)	6 (28.6%)	23 (43.4%)	20 (51.3%)
Thin soles shoes	70 (25.8%)	16 (53.3%)	11 (52.4%)	28 (52.8%)	15 (38.5%)
Barefoot	31 (11.4%)	7 (23.3%)	4 (19.0%)	13 (24.5%)	7 (17.9%)
Socks w/o shoes	26 (9.6%)	5 (16.7%)	5 (23.8%)	12 (22.6%)	4 (10.3%)
Other	35 (12.9%)	7 (23.3%)	5 (23.8%)	12 (22.6%)	10 (25.6%)

Table 43. Humboldt County, CA, participants' awareness of fall prevention separated by rural and urban clusters.

Fall Prevention Awareness	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Aware of medications prescribed? (n)	510	98	412
No	9 (1.8%)	1 (1.0%)	8 (1.9%)
Yes	501 (98.2%)	97 (99.0%)	404 (98.1%)
Doctor or pharmacist talked to them about how their medication may affect their balance? (n)	509	99	410
No	324 (63.7%)	63 (63.6%)	261 (63.7%)
Yes	185 (36.3%)	36 (36.4%)	149 (36.3%)
Ever had a home inspection for risk of falls? (n)	607	129	478
No	520 (85.7%)	122 (94.6%)	398 (83.3%)
Yes	87 (14.3%)	7 (5.4%)	80 (16.7%)
Willing to pay for home modifications to reduce injury? (n)	578	125	453
Cannot afford/not willing	160 (27.7%)	52 (41.6%)	108 (23.8%)
Unlikely	84 (14.5%)	14 (11.2%)	70 (15.5%)
Maybe	113 (19.6%)	18 (14.4%)	95 (21.0%)
Likely	87 (15.1%)	20 (16.0%)	67 (14.8%)
Very willing	134 (23.2%)	21 (16.8%)	113 (24.9%)
Perceived likelihood of falling in the next 12 months? (n)	612	129	483
High	37 (6.0%)	11 (8.5%)	26 (5.4%)
Moderate	141 (23.0%)	34 (26.4%)	107 (22.2%)
Low	368 (60.1%)	70 (54.3%)	298 (61.7%)
None	66 (10.8%)	14 (10.9%)	52 (10.8%)
Assessed in the last 12 months by a health care provider for their risk of falling? (n)	596	127	469
No	498 (83.6%)	116 (91.3%)	382 (81.4%)
Yes	98 (16.4%)	11 (8.7%)	87 (18.6%)

Table 44. Del Norte County, CA, participants' awareness of fall prevention separated by rural and urban clusters.

Fall Prevention Awareness	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Aware of medications prescribed? (n)	122	43	79
No	0 (0.0%)	0 (0.0%)	0 (0.0%)
Yes	122 (100.0%)	43 (100.0%)	79 (100%)
Doctor or pharmacist talked to them about how their medication may affect their balance? (n)	124	42	82
No	72 (58.1%)	26 (61.9%)	46 (56.1%)
Yes	52 (41.9%)	16 (38.1%)	36 (43.9%)
Ever had a home inspection for risk of falls? (n)	144	52	92
No	128 (88.9%)	50 (96.2%)	78 (84.8%)
Yes	16 (11.1%)	2 (3.8%)	14 (15.2%)
Willing to pay for home modifications to reduce injury? (n)	140	48	92
Cannot afford/not willing	55 (39.3%)	20 (41.7%)	35 (38.0%)
Unlikely	19 (13.6%)	7 (14.6%)	12 (13.0%)
Maybe	18 (12.9%)	4 (8.3%)	14 (15.2%)
Likely	18 (12.9%)	9 (18.8%)	9 (9.8%)
Very willing	30 (21.4%)	8 (16.7%)	22 (23.9%)
Perceived likelihood of falling in the next 12 months? (n)	147	52	95
High	9 (6.1%)	1 (1.9%)	8 (8.4%)
Moderate	31 (21.1%)	14 (26.9%)	17 (17.9%)
Low	87 (59.2%)	32 (61.5%)	55 (57.9%)
None	20 (13.6%)	5 (9.6%)	15 (15.8%)
Assessed in the last 12 months by a health care provider for their risk of falling? (n)	143	51	92
No	126 (88.1%)	47 (92.2%)	79 (85.9%)
Yes	17 (11.9%)	4 (7.8%)	13 (14.1%)

Table 45. Humboldt County, CA, fall prevention separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † AMOB = A Matter of Balance. ‡ SAIL = Stay Active and Independent for Life.

Fall Prevention	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Willing to receive fall prevention? (n)	595	121	474
No	213 (35.8%)	53 (43.8%)	160 (33.8%)
Yes	382 (64.2%)	68 (56.2%)	314 (66.2%)
Preferred method of receiving information? (n)*	1336	259	1077
Television	173 (12.9%)	40 (15.4%)	133 (12.3%)
Radio	75 (5.6%)	22 (8.5%)	53 (4.9%)
Newspaper	179 (13.4%)	30 (11.6%)	149 (13.8%)
Internet	375 (28.1%)	83 (32.0%)	292 (27.1%)
Class	159 (11.9%)	13 (5.0%)	146 (13.6%)
Private conversation with health professional	292 (21.9%)	55 (21.2%)	237 (22.0%)
Other	83 (6.2%)	16 (6.2%)	67 (6.2%)
Fall prevention classes willing to take if offered for free? (n)*	1226	231	995
Tai chi	271 (22.1%)	51 (22.1%)	220 (22.1%)
AMOB†	154 (12.6%)	25 (10.8%)	129 (13.0%)
SAIL‡	252 (20.6%)	45 (19.5%)	207 (20.8%)
Walking group	188 (15.3%)	32 (13.9%)	156 (15.7%)
Hiking group	178 (14.5%)	37 (16.0%)	141 (14.2%)
Biking group	87 (7.1%)	19 (8.2%)	68 (6.8%)
Other	78 (6.4%)	19 (8.2%)	59 (5.9%)
Other-water aerobics	5 (0.4%)	0 (0.0%)	5 (0.5%)
Other-Yoga/Pilates	13 (1.1%)	3 (1.3%)	10 (1.0%)

Table 46. Del Norte County, CA, fall prevention separated by rural and urban clusters. * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question. † AMOB = A Matter of Balance. ‡ SAIL = Stay Active and Independent for Life.

Fall Prevention	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Willing to receive fall prevention? (n)	133	41	92
No	54 (40.6%)	23 (56.1%)	31 (33.7%)
Yes	79 (59.4%)	18 (43.9%)	61 (66.3%)
Preferred method of receiving information? (n)*	289	97	192
Television	61 (21.1%)	19 (19.6%)	42 (21.9%)
Radio	16 (5.5%)	7 (7.2%)	9 (4.7%)
Newspaper	20 (6.9%)	6 (6.2%)	14 (7.3%)
Internet	80 (27.7%)	31 (32.0%)	49 (25.5%)
Class	20 (6.9%)	6 (6.2%)	14 (7.3%)
Private conversation with health professional	69 (23.9%)	23 (23.7%)	46 (24.0%)
Other	23 (8.0%)	5 (5.2%)	18 (9.4%)
Fall prevention classes willing to take if offered for free? (n)*	276	103	173
Tai chi	61 (22.1%)	26 (25.2%)	35 (20.2%)
AMOB†	35 (12.7%)	13 (12.6%)	22 (12.7%)
SAIL‡	56 (20.3%)	19 (18.4%)	37 (21.4%)
Walking group	44 (15.9%)	15 (14.6%)	29 (16.8%)
Hiking group	32 (11.6%)	14 (13.6%)	18 (10.4%)
Biking group	19 (6.9%)	6 (5.8%)	13 (7.5%)
Other	23 (8.3%)	7 (6.8%)	16 (9.2%)
Other-water aerobics	3 (1.1%)	2 (1.9%)	1 (0.6%)
Other-Yoga/Pilates	3 (1.1%)	1 (1.0%)	2 (1.2%)

Table 47. Humboldt County, CA, participants' perceived barriers to receiving or accessing the help they need regarding their health separated by rural and urban clusters.
 * Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Perceived Barriers	Humboldt (N = 615)	Rural (n = 130)	Urban (n = 485)
Barriers to receiving or accessing care (n)*	406	98	308
None	116 (28.6%)	13 (13.3%)	103 (33.4%)
Motivation	26 (6.4%)	2 (2.0%)	24 (7.8%)
Transportation	16 (3.9%)	3 (3.1%)	13 (4.2%)
Time	32 (7.9%)	8 (8.2%)	24 (7.8%)
Assistance with ADL*	15 (3.7%)	4 (4.1%)	11 (3.6%)
Availability in local area	12 (3.0%)	6 (6.1%)	6 (1.9%)
COVID	12 (3.0%)	1 (1.0%)	11 (3.6%)
Medical condition	30 (7.4%)	6 (6.1%)	24 (7.8%)
Do not like groups	5 (1.2%)	1 (1.0%)	4 (1.3%)
Distance/geographic location	47 (11.6%)	37 (37.8%)	10 (3.2%)
Availability of medical appointments	7 (1.7%)	2 (2.0%)	5 (1.6%)
Finance	26 (6.4%)	3 (3.1%)	23 (7.5%)
Shortage of providers	23 (5.7%)	7 (7.1%)	16 (5.2%)
Other	39 (9.6%)	5 (5.1%)	34 (11.0%)

Table 48. Del Norte County, CA, participants' perceived barriers to receiving or accessing the help they need regarding their health separated by rural and urban clusters.

* Denotes characteristic is displayed as a frequency value and the number and percentages depict the number of times a data value was selected within that question.

Perceived Barriers	Del Norte (N = 147)	Rural (n = 52)	Urban (n = 95)
Barriers to receiving or accessing care (n)*	83	26	57
None	20 (24.1%)	7 (26.9%)	13 (22.8%)
Motivation	2 (2.4%)	0 (0.0%)	2 (3.5%)
Transportation	2 (2.4%)	1 (3.8%)	1 (1.8%)
Time	3 (3.6%)	1 (3.8%)	2 (3.5%)
Assistance with ADL*	2 (2.4%)	1 (3.8%)	1 (1.8%)
Availability in local area	6 (7.2%)	1 (3.8%)	5 (8.8%)
COVID	2 (2.4%)	0 (0.0%)	2 (3.5%)
Medical condition	8 (9.6%)	2 (7.7%)	6 (10.5%)
Do not like groups	0 (0.0%)	0 (0.0%)	0 (0.0%)
Distance/geographic location	14 (16.9%)	5 (19.2%)	9 (15.8%)
Availability of medical appointments	3 (3.6%)	1 (3.8%)	2 (3.5%)
Finance	7 (8.4%)	3 (11.5%)	4 (7.0%)
Shortage of providers	4 (4.8%)	1 (3.8%)	3 (5.3%)
Other	10 (12.0%)	3 (11.5%)	7 (12.3%)