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War-Related Life Course Stress and Late-Life Subjective Age in Northern Vietnam

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Abstract

Background and Objectives: The role of early life stressors in subjective aging is weakly understood, especially in low- to middle-income countries. This paper investigated how early life stressors encountered in armed conflict influence subjective age among Vietnamese older adults who experienced war over decades of their early life.

Research Design and Methods: We analyzed survey data from the 2018 Vietnam Health and Aging Study involving 2,447 Vietnamese older adults who encountered diverse war-related stressors in early adulthood. The analytical sample (*N* = 2,341) included 50.9% women and 49.1% men, with an average age of 69.8. 41.1% are military veterans. We conducted survey-adjusted multinomial logistic regression analyses with mediation to predict the probability of feeling younger or older than one's chronological age. We examined how childhood adversity (i.e., childhood hunger and low parental SES) and wartime stressors (i.e., war-related violence, malevolent environment, and military service) influenced late-life subjective age, both directly and as mediated by late-life mental, functional, and physical health.

Results: We found significant associations between early adulthood war-related stressors and subjective age. Formal military service significantly lessened the relative risk of feeling subjectively old, and more plentiful wartime violence exposures significantly increased the risk of feeling younger than one's chronological age. Violence exposure's effects were both direct and indirect through functional and mental health. Conversely, greater exposure to wartime malevolent conditions (e.g., shortages of clean water and evacuations) and multiple episodes of severe hunger in childhood increased the risk of feeling older, effects both direct and mediated by late-life functional and mental health.

Discussion and Implications: Results suggest wartime stressors, especially war's malevolent environments and severe childhood hunger, experienced in many conflict-affected populations globally, have the potential to subjectively "age" survivors. Yet, not all war exposures are equal, and some may yield psychological and socioeconomic resources that support healthy aging.

Translational Significance: Although subjective age carries substantial theoretical and predictive power for older adult health and longevity, analyses of the predictors of subjective age in low- and middle-income countries have been sparse. Additionally, armed conflict and its associated stressors are globally pervasive and instructive for understanding the underpinnings of subjective age. This study's main findings, specifically that malevolent stressors encountered in war increase the odds of feeling relatively old relative to one's chronological age, point to the importance of interventions among older armed conflict survivors to lessen stress and enhance subjective well-being as possible means to promote late-life health and longevity.

Background and Objectives

Subjective age, an aging marker capturing how old one *feels* compared to their chronological age, is a predictively powerful concept in efforts to grasp social, psychological, and physiological factors underpinning aging (Blau, 1956; Palgi et al., 2019). Despite its predictive power, analyses of subjective age are scant in low- and middle-income countries (LMICs), where rapid population is occurring and where social constructions

of aging and "old age" may diverge from more affluent settings (Huang, 2013; Velaithan et al., 2023). Subjective age has not been widely examined in conflict-affected societies, excepting several informative studies conducted in Israel (e.g., Avidor et al., 2016; Solomon et al., 2009). In several analyses of subjective age within cohorts differentially influenced by military service and armed conflict (e.g., South Korean older adults), war exposure and associated stressors are not examined as

covariates (e.g., Hwang and Hong, 2019). Expanding the investigation of subjective age to a setting like Vietnam, an LMIC deeply affected by armed conflict, can further illuminate how patterns and predictors of subjective age diverge across contexts with varied levels of economic development, histories of armed conflict, and attitudes toward aging and older members of society.

Subjective age is informed not only by physiology and psychology but also by the sociocultural contexts within which aging processes occur and by contextual stressors, shocks, and crises (Wurm & Westhoff, 2015). For example, several studies identified heightened loneliness, social stressors, and malnutrition during the corona virus disease 2019 pandemic as contributors to older subjective age (Schorr et al., 2021; Terracciano et al., 2021). Adverse social contexts, such as those resulting from armed conflict or natural disasters, exacerbate individual stressors that may accelerate aging (Avidor et al., 2017; Epel, 2004; Shrira et al., 2011). Accordingly, theories of subjective age can be enriched through analyses of populations that have endured diverse and often severe stressors of armed conflict in their lifetimes. However, outside of the Israeli example (e.g., Avidor et al., 2016; Bachem et al., 2019), investigation of these associations has been absent in populations affected by armed conflict globally, especially in LMICs where 20th century armed conflicts have concentrated (Armed Conflict Location & Event Data Project, 2023). Examining post-conflict populations can provide insights not only into physiological and psychological scarring associated with war exposures but also into the resilience that may emerge among survivors and victors of such conflicts.

A life-course framework recognizes differential exposure to adversity over the life span and its relevance for health and aging disparities (Yang et al., 2022). Schafer (2009:76) observes, "subjective age, like most processes in adulthood, does not materialize in an instant, but stems from lifelong, socially-embedded developmental experiences." This follows stress proliferation models, which view morbidities and accelerated aging as linked to compounding adversities over time (Benson, 2014; Pearlin et al., 2005). Populations that have experienced war often face distinctive stressors over the lifespan, spanning pre and postconflict periods (e.g., food shortages, postconflict readjustment), with enduring ramifications for health and wellbeing (Kang et al., 2016; Lee et al., 2022). Resource deprivation and malnutrition, frequently occurring in wartime, also relate to perceived age and processes underlying accelerated aging (Xie et al., 2023). Scholarship on survivors of famine suggests that older adults who endured periods of severe undernutrition, prenatally as well as in childhood and adolescence, are more likely to experience a range of health problems in older adulthood, which may contribute to older subjective age (Han & Hong, 2019; Van Abeleen et al., 2012, 2013),

War-related stressors do not occur in a vacuum; they are embedded within social and economic hierarchies and cumulative lifespan trajectories that condition their impact (Bachem et al., 2019; Lee et al., 2022). Bachem et al.'s analyses of Israeli POWs found that adverse childhood events were consequential for subjective age and seemed to "prime" individuals for accelerated aging with the occurrence of each additional conflict or postconflict stressor (Ibid). Concurrently, in conflict-affected countries characterized by economic insecurity, limited social welfare programming, and few socioeconomic mobility ladders, military service may

bestow opportunities for accruing wealth and human capital that are beneficial over the life course (Costa & Kahn, 2006; Lee, 2007). Service-related psychological and social resources may stave off subjective aging by imbuing veterans with a sense of vitality and purpose and lessening ill consequences of poor physical and psychological health that tend to make war survivors feel older.

Physical and psychological health problems that emerge in the wake of war also pertain to subjective age. Among community-dwelling Israelis exposed to rocket attacks and other conflict violence, those suffering from posttraumatic stress disorder (PTSD) reported older subjective age than counterparts without (Avidor et al., 2016, 2017; Palgi et al., 2019; Solomon et al., 2009). Because PTSD and depression elevate risks for morbidities such as heart disease and dementia (Creasey et al., 1999), they are posited mediators through which the stressors of armed conflict heighten subjective age (Avidor et al., 2018; Solomon et al., 2014). Moreover, exposure to armed conflict has been directly linked to frailty and chronic conditions later in life (Korinek et al., 2020; Zimmer et al., 2022), suggesting disability and chronic illness may mediate war exposure and subjective age as they tend to "make people aware of their aging" and thus feel relatively old (Mathur & Moschis, 2005:969; Solomon et al., 2009). PTSD and other psychological morbidities, aside from their inducing traumas, may create a sense of "embattled survival," which compounds later life adversities and makes one feel older than one's chronological age (Avidor et al., 2016:422).

Figure 1 illustrates our conceptual model. The model considers associations between early-life war exposures, adverse childhood circumstances, and subjective age in a broader context of postconflict societal transitions in which socioeconomic conditions and recent stressful life events are among the constellation of social factors influencing subjective age. Military service, and appraisals of its meaning, varies considerably across categories and cohorts of veterans (Aldwin et al., 1994). Whereas for some military service is associated with difficult duty, moral injury, and enduring health burdens, for others it is associated with meaningful accomplishment, a sense of mastery, and elevated status. Accordingly, military service may yield significant stress, but also psychological resources such as hardiness or resilience that promote healthy aging (King et al. 1998).

Past research consistently identifies a range of health outcomes, spanning several domains, as accounting for the greatest proportion of variance in subjective health (Hubley and Russell, 2009). Ill health conditions, as they provide negative

Conceptual Framework for Early Life Stress in War and Late-Life Subjective Age.
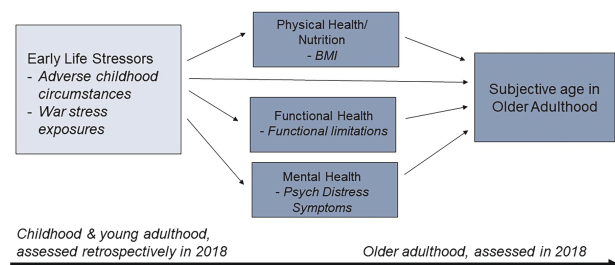

Figure 1. Conceptual framework for early life stress in war and late-life subjective age.

information about aging, inform an older self-concept and thus a subjective sense of being old relative to one's chronological age (Alonso Debreczeni & Bailey, 2021). Our conceptual framework therefore considers distinct dimensions of late-life health status posited to mediate early life stressors and subjective age in older adulthood. Although Vietnam has recently seen a "double burden" of underweight and overweight emerge, quite few older adults are obese, and low BMI indicating underweight is a more significant problem (Ly et al., 2013). Past research demonstrates that underweight older adults are more likely to suffer from physical frailty, sarcopenia, poor health-related quality of life, and poor physical health more generally (Cohen et al., 2016; Hubbard et al., 2010; Kvamme et al., 2010; Reijnierse et al, 2015). Additionally, especially in a postconflict context like Vietnam, underweight may reflect the cumulative adversities associated with poor nutrition encountered in wartime and periods of postwar hardship (Kvamme et al., 2011). Thus, *underweight BMI* is conceived as a mediator between early life stressors and subjective age.

Limitations in physical functioning, which act as reminders of aging, represent heightened dependency, and challenge one's sense of control, have been found to correlate with older subjective age (Hubley and Russell, 2009; Prasad et al., 2023; Stephan et al., 2015). Thus, older adults' *number of functional limitations* is considered a mediator between early life stressors and subjective age. Finally, numerous studies observe significant associations between mental health and subjective age (Bergland et al., 2014; Alonso Debreczeni & Bailey, 2021). In the Vietnamese context, where those exposed to more severe war stressors in early life experience greater levels of psychological distress in older adulthood (Kovnick et al., 2021), *symptoms of psychological distress* are conceived as mediating the association between early life stress and subjective age.

The study of subjective age within Vietnam is nascent. This study joins a relatively small subset of investigations of subjective age in Asian populations more broadly. Several studies among older Chinese adults yield results that deviate significantly from typical Western trends, suggesting only a small minority of Chinese older adults feel younger than their chronological age (Liang, 2014; Ying & Yao, 2010). For example, one of the first Chinese studies of subjective age found that 92% of Chinese older adults reported feeling old relative to their chronological age (Liang, 2014). There is emerging evidence in the Chinese context that the tendency toward feeling older may be linked, in part, to early life adversities such as hunger and inadequate health care (Xie et al., 2023).

Several previous studies demonstrate that older adults exposed to severe war-related stressors in the 1960s and 1970s Democratic Republic of Vietnam (DRV) experience penalties in late-life cardiovascular disease, mental health, frailty, and other conditions (Korinek et al., 2020; Kovnick et al., 2021; Zimmer et al., 2022). Vietnam's twentieth-century history, which encompassed several wars and massive economic restructuring, also occasioned severe poverty and hunger for major population segments (Witter 1996). Vietnam's 1944–45 famine, wrought by Japanese occupation, was particularly devastating, with an estimated 400,000 to 2 million experiencing death by starvation (Gunn, 2011; Porter, 1993). Following the American war's millions of casualties and devastated infrastructure, the same cohorts endured economic crises (e.g., negative GDP growth, widespread hunger, and poverty, massive outmigration) through the postconflict collectivization period and into the mid-1980s (Dollar et al., 1998). Yet through these difficult decades, exposures were widely heterogenous. Many faced personal loss and injury, others were more distant from the fighting, whereas still others accrued a range of benefits through participation (Teerawichitchainan, 2009). Vietnam and its war cohorts are thus uniquely suited for addressing the following hypotheses:

(1) OLDER subjective age will characterize individuals who experienced greater exposure to wartime stressors in early life (1a). However, formal military service, thought to provide psychological and material benefits over the life course, will bestow a protective effect and be associated with YOUNGER subjective age (1b).
(2) The ill effects of early life wartime stressors upon older subjective age will be partly MEDIATED by recent poor (a) physical, (b) functional, and (c) mental health.
(3) Considering adverse circumstances of childhood in this conflict-affected setting, respondents reporting prolonged periods of severe hunger in their youth, or low levels of parental education, will feel OLDER than their chronological age.

Research Design and Methods

Data

Data are from the Vietnam Health and Aging Study (VHAS), conducted in 2018. VHAS analyzed dynamic linkages between war exposure, mortality, and morbidity in a cohort of older adults that experienced firsthand one of the 20th century's most devastating armed conflicts (Korinek et al, 2019). VHAS used a multistage sampling design, which began by purposively selecting four districts across a spectrum of war exposure as indicated by aerial bombing intensity (Ibid.; Miguel & Roland, 2011). Next, VHAS randomly selected 12 communes from within districts. Finally, it randomly sampled participants in selected communes, using disproportionate random samples to ensure adequate statistical power across gender and military service subdomains. A detailed interview, translated from English to Vietnamese and back-translated from Vietnamese to English, was used to conduct in-person interviews with all subjects. For additional details on the VHAS sampling methodology see Korinek et al. (2019). The entire VHAS sample consisted of 2,447 Vietnamese ages 59 and older.

Measures

Subjective age

The dependent variable was based on the following survey question: "I know that you are currently [__] years old. People sometimes feel younger or older than their age. Do you feel younger, older, or about your age?" We treated the latter option, feeling about the same as one's chronological age, as the reference group among three unordered categories.

Early life stressors

Wartime stress exposures.

—comprise the first set of covariates for assessing early life stress. Most respondents encountered stressors of the American War in their late adolescence and early adulthood.

We first included a categorical variable for the respondent's lifetime military service, indicating whether the respondent served in the formal military (i.e., predominantly the North Vietnamese Army), an informal military organization such as the Youth Shock Brigades (Guillemot 2009), or never served in a formal or informal military organization. These broad categories of participation encompass wide-ranging duties, types of deployment, and stress exposures.

VHAS also included extensive questions about exposure to specific wartime stressors that military participants or civilians may have experienced. These were drawn from the Deployment Risk and Resilience Inventory (King et al., 2006) and the Combat Exposure Scale (Keane et al. 1989) which have been validated among American and Korean veterans of the Vietnam War (Kim et al., 2012). Factor analyses were used to reduce the questions into two indices (Young et al. 2021). The first captures wartime violence encounters, based on respondents' reports of having: (a) engaged in combat patrols or dangerous duties; (b) experienced being ambushed; (c) engaged in a unit that fired at the enemy; (d) caused the death of an enemy combatant; (e) experienced a near miss of being shot; (f) witnessed a friend/comrade shot in battle; (g) been exposed to toxic chemicals during the war (h) been wounded as a result of the war; (i) seen dead Vietnamese soldiers; (j) seen dead American soldiers; (k) seen dead civilians; and (h) known someone seriously injured or killed in war. Items 1–6 were asked only of respondents who served in the formal military, militia organizations, or the Youth Shock Brigades. Additionally, factor analyses identified different items as reliable indicators of violence exposure for members of the formal military, informal military, and civilians. Because the items comprising the index differ for the formal military, informal military, and civilians, index scores were standardized. Thus, means are zero and standard deviations are one.

The second index of war exposure was modified from Fontana and Rosenheck's (1999) assessment of wartime malevolent living conditions encountered by American veterans of the Vietnam War. The questions, applicable to both military and nonmilitary populations within the Vietnam context, queried whether respondents: (a) had to move as a result of the bombing of their home/village; (b) had to evacuate (as a precursor to expected bombing or other attack); (c) experienced a lack of clean water; (d) experienced food shortage that caused illness or weakness; and/or (e) experienced difficulty sleeping due to noise or inhospitable surroundings. Like the war violence index, factor analysis confirmed different index items for the military and nonmilitary groups. Thus, we also standardized this index.

Childhood adverse circumstances.
—comprise the second set of early life stress covariates. Two variables assessed the respondent's childhood circumstances. Severe hunger during childhood was assessed through the question: *"Did you experience severe hunger (e.g., going to bed hungry, having to scavenge for food) for a month or longer due to food shortage during your childhood (i.e., from when you were born, up to and including age 15)?"* Responses indicated: never, just one time, or on multiple occasions. Childhood adverse socioeconomic conditions were assessed based on respondent self-reports of having had a parent with little or no formal schooling versus primary or higher.

Current health conditions.
—*Current nutrition status and physical health* are assessed by BMI and chronic conditions. BMI is measured in the VHAS health examination and assessed per World Health Organization (WHO Expert Consultation, 2004) categories recommended for Asian populations: underweight (<18.5), normal (18.5–23.9), increased risk (24–27.5) and highest risk (>27.5). For Vietnamese older adults, underweight status is of particular interest as it may proxy malnutrition in the life course or recent ill health (Ly et al., 2013). We also included a count (range: 0–9) of self-reported chronic conditions recently experienced by the respondent, including hypertension, diabetes, COPD, heart disease, cancer, liver disease, stroke, arthritis, and asthma.

Current functional health is assessed through a count measure indicating seven self-reported functional limitations that respondents experienced at the time of the interview, e.g., difficulty walking 200–300 m, standing up, climbing a flight of stairs.

Current mental health is assessed through a measure of current psychological distress. We measure psychological distress through an index adapted from the 10-item Self-Reporting Questionnaire (SRQ) (Beusenberg & Orley, 1994). The SRQ has been validated with Vietnamese populations (Richardson et al., 2010). Following previous studies (Chipimo & Fylkesnes, 2013), the VHAS index included ten items (Cronbach's alpha = 0.74) detailing certain emotional (e.g., the urge to cry more than usual) or physical (e.g., insomnia) expressions of distress in the past month.

Social context and sociodemographic covariates
Because 'catalytic' life events are posited to influence subjective age, triggering a cognitive shift from a stable sense of one's age toward feeling older (Van Auken et al., 2006), we assessed respondents' perceived stress associated with six major *stressful life events* enumerated in the past 2–3 years. Selected major life events, relevant to older Vietnamese adults and with potential associations to stressors occurring earlier in life, were drawn from the Holmes–Rahe Stress Inventory (1967), which has previously been validated in older adults (Tibubos et al., 2021). If respondents indicated they experienced an event (e.g., death of a spouse, major residential move), a follow-up question inquired about the degree of stress associated with the event. The measure indicated the number of recent events (range: 0–6) with which the respondent reported experiencing little, moderate, or a lot of stress.

Another aspect of current social context relevant to subjective age is **socioeconomic status**. We include three indicators of socioeconomic status: educational attainment (binary variable indicating completion of high school or more vs. less education); main lifetime occupation assessed categorically, whether agricultural (reference), professional, or other; and household wealth assessed by a count of the respondent's household assets including television, phone, refrigerator, air conditioner, motorcycle, car, computer, and home internet (range: 0–8).

Sociodemographic control covariates included in all models include gender (assessed as man/woman from socially identified status/pronouns), age (assessed by date of birth), and district of residence. District of residence controls for community-level socioeconomic variability within the sample,

pertinent to subject age, which is not adequately captured in individual-level measures of socioeconomic status.

Analytical approach

We present descriptive statistics, then estimate and refer to bivariate correlations, followed by mediation models of subjective age with one categorical mediator—BMI, and two continuous mediators—indices of functional limitations and recent psychological distress. As an intermediate step, we conduct hierarchical logistic regression analyses predicting subjective age to ascertain potential mediation of early life stressors through current health conditions. Mediation models then assess the probability of feeling older and younger than one's chronological age relative to the same as one's chronological age. We utilized Stata 17's *gsem* command to estimate a generalized structural equation model (GSEM) for four equations with indirect paths through three mediators to our dependent variable (Figure 1) (StataCorp, 2021). Because subjective age is a naturally unordered categorical variable, we used a multinomial specification (e.g., a multinomial distribution family with a logit link function) for the equation containing our dependent variable. The equations modeling our mediators used linear specification for those with continuous variables (Gaussian distribution with an identity link function) and a multinomial logit specification for the ordinal variable (BMI). Though preliminary model tests used the stepwise introduction of variables in a set of hierarchical logistic regression models to check for mediation (Supplementary Table 2), the GSEM with mediation computed all equations simultaneously. We evaluated several potential mediation structures to identify the final model structure—with (a) all mediators included individually, (b) mediator groups combined into indices (e.g., socioeconomic variables combined into a single mediator), and (c) latent mediators reflecting each group of mediators. We evaluated goodness of fit statistics to determine final model parameters. We conducted Sobel tests of mediation. Finally, we computed nonlinear combinations of parameters to determine direct, indirect, and total effects on subjective age associated with each focal explanatory variable. The current models are those that yielded the best model fit.

Missing values

One of our variables, BMI, contained a relatively high proportion of missing values (7.4%, *n* = 181), with nonrandom missing data. We conducted multiple imputation (MI) using multivariate ordinary least squares regression in Stata 17, which uses an iterative Markov chain Monte Carlo (MCMC) imputation. Following the "best practices" recommended for MI, our imputation included all analysis variables plus variables that potentially predict missingness (Dong & Peng, 2013; Medeiros, 2016). Sensitivity analyses of alternate treatments of missing values confirmed our assumption that the data were not missing at random, and that the significance of missingness was otherwise uninformative.

Following MI for BMI, listwise deletion resulted in an analytical sample of 2,341. Missingness was largely due to proxy respondents (*N* = 87) who were not allowed to answer the question about subjective age. Of additional nonproxy cases with missing data (*N* = 39), feeling older than one's age was more pronounced (56.4%) as compared to cases without missing data (44.8%) (Pearson chi-square 4.49). Consistent with relatively older respondents relying upon proxies, compared to those included in the analytical sample, those missing were about 10 years older on average, experienced approximately two additional functional limitations, and were disproportionately women (58.3% versus 50.8%, Pearson chi-square = 2.33).

Results

Table 1 shows the characteristics of respondents in the analytical sample and across categories of subjective age. More VHAS respondents felt older than their chronological age (45%) than younger (13%) or the same (42%) as their chronological age. The VHAS sample consisted of slightly more women (51%) than men (49%), with a mean age of 70. Overall, respondents' socioeconomic status was low. Most of the sample (85%) had less than secondary education, and two-thirds reported lifetime occupation in agriculture.

Stressors related to war were fairly common in the sample. Sixty-seven percent engaged in either formal or informal military service. Although standardized indices have a group mean of zero, unstandardized data indicate that, on average, respondents experienced two types of wartime violence exposure and two types of malevolent environment stressors. Because many experienced a given type of exposure multiple times, this translated to roughly 10.8 separate exposures to war violence and 10.7 exposures to malevolent wartime conditions, on average.

Many participants reported difficult childhood circumstances. Specifically, 37.3% indicated experiencing multiple severe episodes of hunger during childhood. Most VHAS respondents originated from households with limited formal education. Only 19% had a parent who completed primary schooling.

Regarding health, high BMI (≥27.5) was uncommon (3%), whereas 5× as many (15%) were underweight (BMI < 18.5). The average respondent suffered from nearly three functional limitations, and nearly two chronic conditions. Seventy-eight percent indicated some degree of psychological distress in the past month, with an average psychological distress index score of 3.43. On average, respondents experienced one of six queried major life events that they deemed stressful in the past 2–3 years.

Test statistics and post hoc tests assessing bivariate associations between model covariates and subjective age are shown in the final two columns of Table 1. Significant bivariate associations were observed between subjective age and each wartime stressor variable. Average violence-related stress exposures were relatively high among those reporting old subjective age and young subjective age, whereas malevolent environment stressors were relatively low among those reporting young subjective age and relatively high among those reporting old subjective age. Respondents involved in the Youth Shock Brigades and other informal military organizations disproportionately reported older subjective age. In contrast, respondents with formal military service were underrepresented in the category of feeling older than their chronological age. Concerning childhood circumstances, a relatively large share of those who experienced severe childhood hunger reported feeling older than their age relative to their total share in the sample.

Consistently, respondents with worse current health status (i.e., underweight, more functional limitations, more comorbidities, higher psychological distress) were overrepresented

Table 1. Summary Statistics by Subjective age

Variable	Age respondent feels				Test statistic[a]	Signif. diff. across categories[b]
	Total	1. Younger than my age	2. I feel as old as I am	3. Older than my age		
	% or mean (*SD*)	% or mean (*SD*)	% or mean (*SD*)	% or mean (*SD*)		
Subjective age	100.00%	13.20%	41.99%	44.81%		
Early life stressors						
War stress exposures						
Type of military service (3-cat)					23.65	
No military service	33.20%	31.80%	30.82%	35.85%		
Informal military service	25.71%	23.28%	23.30%	28.70%		
Formal military service	41.08%	44.92%	45.88%	35.46%		
Exposure to violence index, standardized[c]	0.01	0.06	–0.07	0.08	5.59	2 < 3
	(1.00)	(1.01)	(0.98)	(1.01)		
Malevolent conditions index, standardized[c]	0.00	–0.07	–0.11	0.13	15.64	1 < 3, 2 < 3
	(1.00)	(0.99)	(0.95)	(1.03)		
Childhood circumstances						
R experienced severe hunger as a child					8.38	
No	54.42%	57.05%	57.11%	51.11%		
Yes, only once	8.31%	4.92%	10.72%	7.05%		
Yes, on multiple occasions	37.27%	38.03%	32.16%	41.84%		
Parents' education					6.39	
Less than primary	81.04%	76.07%	81.24%	82.32%		
Primary or higher	18.96%	23.93%	18.76%	17.68%		
Current health						
Weight status (based on BMI)					75.76	
Underweight (BMI < 18.5)	14.79%	5.92%	10.88%	21.14%		
Acceptable risk (BMI 18.5–23.9)	61.95%	63.41%	62.57%	60.93%		
Increased risk (BMI 24–27.5)	20.22%	26.13%	23.50%	15.34%		
Highest Risk (BMI > 27.5)	3.04%	4.53%	3.05%	2.59%		
# Functional limitations	2.71	1.82	2.20	3.46	101.24	1 < 2, 1 < 3, 2 < 3
	(2.40)	(2.09)	(2.26)	(2.41)		
# Comorbid health conditions	1.68	1.39	1.57	1.88	28.62	1 < 3, 2 < 3
	(1.46)	(1.27)	(1.41)	(1.52)		
Psychological distress (SRQ)	3.43	2.82	2.77	4.23	123.10	1 < 3, 2 < 3
	(2.33)	(2.24)	(2.09)	(2.33)		
Social status covariates						
Total # life stressors (past 3 years)	0.93	0.83	0.74	1.14	46.84	1 < 3, 2 < 3
	(0.96)	(0.87)	(0.90)	(1.00)		
R's primary occupation					49.43	
Farmer	66.62%	53.77%	63.51%	73.33%		
Professional	12.29%	15.41%	13.51%	10.24%		
Other	21.08%	30.82%	22.99%	16.43%		
Highest level of schooling completed					32.96	
Less than high school	85.06%	77.70%	82.78%	89.37%		
High school or more	14.94%	22.30%	17.22%	10.63%		
# Assets in the Household (weighted)	2.29	2.49	2.44	2.09	42.11	1 > 3, 2 > 3
	(0.96)	(0.98)	(0.91)	(0.97)		
Control variables						
Sex of participant					13.55	
Male	49.09%	52.13%	52.89%	44.64%		
Female	50.91%	47.87%	47.11%	55.36%		

Table 1. Continued

Variable	Age respondent feels				Test statistic[a]	Signif. diff. across categories[b]
	Total	1. Younger than my age	2. I feel as old as I am	3. Older than my age		
	% or mean (*SD*)	% or mean (*SD*)	% or mean (*SD*)	% or mean (*SD*)		
Age	69.78 (7.95)	70.06 (7.78)	69.71 (8.17)	69.77 (7.80)	0.22	

Notes: BMI = body mass index; *SD* = standard deviation; SRQ = Self-Reporting Questionnaire.
[a]Test statistics for numeric variables are *F*-statistics obtained from ANOVA. Test statistics for categorical variables are overall Chi-square statistics for the variable. Pairwise statistics for each category are not available.
[b]Statistical significance across groups references post hoc pairwise comparisons of means using Tukey–Kramer and Fisher–Hayter pairwise tests with 95% confidence level.
[c]Because the indices are standardized by category of military service, the means for each group are zero. When combined the multigroup mean is approximately zero.

in the category of feeling older than their chronological age and underrepresented in the young subjective age category. Concerning the current social context, total recent life event stressors were significantly greater among those reporting feeling older than their chronological age. Concerning socioeconomic status, a greater proportion had high school or higher education among those who felt younger than their chronological age as compared to those who felt their age or felt older, whereas respondents with relatively low levels of education were more prevalent in the category feeling older than their age. Bivariate statistics also revealed significant positive associations between older subjective age and agricultural lifetime occupation. Household assets and male gender exhibited significant negative associations with older subjective age.

To inspect the data for potential issues of multicollinearity, we estimated correlation coefficients for all covariates in the GSEM using Stata's *polychoric* command (see Supplementary Materials). Coefficients reiterated associations shown in Table 1 and were consistently below 0.50. VIFs computed for all covariates (mean VIF: 1.41, Max: 2.13) further confirmed data were not characterized by multicollinearity.

Prior to estimating the GSEM, we estimated a series of hierarchical logistic regression models to examine associations between our explanatory and proposed mediating covariates. Results of these models, shown in the Supplementary Materials (Table 2), indicated that the regression coefficients for early life stressors are modified when current health covariates are added in Models 2–6. This suggests that the mediation process involves several current health conditions. Our GSEM model reflects this structure.

Results of the generalized structural equation model are shown in Table 2. The first three columns contain coefficients from equations predicting each of the mediating variables, which is, BMI (categorical variable, Equation 1), and functional limitations and psychological distress (continuous variables, Equations 2 and 3). These are followed by two columns of coefficient estimates for each category of the dependent variable, subjective age (Equation 4).

Model results provided support, albeit mixed, for hypotheses concerning war exposure's direct and indirect associations with subjective age. The first equation indicated that high/increased risk BMI is modestly associated with exposure to wartime violence. The second equation demonstrated wartime violence and malevolent conditions were significant and

positively associated with respondents' current functional limitations. In the third equation modeling psychological distress, we observed significant, positive associations with each war exposure covariate included in the model.

The multinomial logit equation predicting subjective age indicated that war-related stressors, in particular greater violence exposure scores, significantly elevated the odds of feeling younger, whereas greater malevolent environment scores significantly elevated the odds of feeling older. Informal military service exhibited no direct effects with subjective age, whereas the effect of formal military service on feeling older was significant and negative. The multinomial logit equation predicting subjective age also demonstrated significant, direct associations with each of the mediating variables assessing current health status. Being underweight, having more numerous functional limitations, and elevated psychological distress scores were associated with greater odds of feeling older, whereas those with high and elevated BMI were less likely to feel older than their counterparts with BMI in the normal range. Being underweight and having relatively numerous functional limitations lessened the probability of feeling younger. Whereas not addressed as a mediator, more numerous chronic conditions lessened the probability of feeling younger.

Supporting our third hypothesis regarding childhood adverse circumstances, results indicated that relative to no reported episodes of severe childhood hunger, multiple occasions of severe hunger in childhood were significantly, positively associated with psychological distress and feeling older than one's chronological age. A modest association was observed between experience of just one hunger episode, relative to none, and feeling younger. Adverse childhood circumstances did not exhibit significant associations with BMI or functional limitations.

To advance interpretation of the model's direct and indirect pathways, we present calculated coefficients for indirect effects associated with adverse childhood circumstances and wartime stressors, as well as Sobel test results for mediation, in Table 3 (Baron & Kenny, 1986; Preacher & Leonardelli, n.d.). In terms of older subjective age, Table 3 confirms significant indirect effects of violence exposure and malevolent conditions mediated through functional limitations. For younger subjective age, mediation through functional limitations was found for violence exposure. In addition to their direct effects upon older subjective age (as shown in Table 2), the effects

Table 2. Generalized Structural Equation Model Estimating the Relationship Between Early Life Stressors and Subjective age with Late-Life Health Status Mediators

Variable	*Mediator 1*		*Mediator 2*	*Mediator 3*	*Dependent variable*	
	Weight status: underweight	**Weight status: increased risk**	**Functional limitations**	**Psychological distress**	**Feel younger**	**Feel older**
Early life stressors						
War stress exposures						
Type of military service (3-cat)						
Informal military service	–0.021	0.277	0.162	0.263*	0.108	-0.140
Formal military service	–0.305	0.118	0.207	0.410**	0.012	–0.468**
Exposure to violence index	–0.092	0.148*	0.164***	0.254***	0.192*	–0.011
Malevolent conditions index	–0.099	–0.012	0.108*	0.269***	0.017	0.115*
Childhood circumstances						
Severe hunger as a child						
Yes, only once	0.015	–0.147	–0.201	–0.239	–0.758*	–0.293
Yes, on multiple occasions	0.192	–0.15	–0.058	0.198*	0.109	0.212*
Parents' education	–0.276	0.033	0.058	–0.106	0.223	0.012
Current health mediators						
Weight status (ref: acceptable)						
Underweight (BMI < 18.5)					–0.648*	0.587***
Increased & high risk (BMI > 24)					0.139	–0.343**
# Functional limitations					–0.142***	0.150***
Psychological distress (SRQ)					0.071	0.165***
Current health and social status						
# Comorbid health conditions					–0.165**	0.069
Total # life stressors (past 3 years)	0.132*	–0.049	0.479***	0.703***	0.149	0.155**
Highest level of schooling	–0.213	0.066	–0.125	–0.286*	0.251	–0.177
# Assets in the household	–0.276***	0.167*	–0.283***	–0.324***	0.009	–0.219***
R's primary occupation (ref: agriculture)						
Professional	–0.464	0.672***	–0.08	–0.117	0.235	0.107
Other	–0.454*	0.635***	–0.016	–0.143	0.471**	–0.248
Control variables						
Sex: Male (ref: Female)	0.274	–0.440**	–0.953***	–0.795***	–0.243	0.237
Age	0.013	–0.022**	0.087***	–0.006	0.023*	–0.030***
District						
Yen Khanh	–0.761***	0.526***	0.386***	0.262*	0.435*	–0.508***
Dong Hoi	0.071	0.145	0.251+	–0.179	–0.016	–0.155
Bo Trach	–0.334	0.028	0.021	0.185	–0.564*	–0.363*
Constant	–1.547*	–0.164	–2.909***	4.076***	–2.811***	1.773**
var(e.FunctLimitat)						4.463***
var(e.PsychDistress)						4.149***
cov(e. FunctLimitat, e. PsychDistress)						1.779***

Notes: N = 2,341. BMI = body mass index; SRQ = Self-Reporting Questionnaire.
*p < .05. **p < .01. ***p < .001.

of childhood hunger, wartime violence exposure, malevolent conditions, and military service were mediated by psychological distress. Violence exposure and informal military service did not exhibit direct effects on feeling older but were mediated by psychological distress. There were no significant indirect effects of war exposures on younger subjective age mediated through psychological distress.

Returning to Table 2, recent life event stressors are significant, positive predictors of underweight BMI, functional limitations, psychological distress, and feeling older than one's chronological age. In terms of socioeconomic status,

household assets were positively associated with BMI, and negatively associated with functional limitations, psychological distress, and older subjective age. We also observed modest, mixed associations between subjective age and respondent's lifetime occupation. A range of significant coefficients for district of residence suggests that socioeconomic and development features of districts matter for late-life health and subjective experience of age.

Finally, respondent sociodemographic characteristics demonstrated several significant associations with subjective age. Each year of respondent age increased the probability of

Table 3. Direct, Indirect, and Total Effects of Early Life Stressors (ELS) in Generalized Structural Equation Model Predicting Subjective age (SA)

Early life stressors (ELS)	Indirect effects: ELS→*functional limitations*→SA				Indirect effects: ELS→*psychological distress*→SA			
	Young SA		Old SA		Young SA		Old SA	
	Coef.	Sobel test	Coef.	Sobel test	Coef.	Sobel test	Coef.	Sobel test
Multiple hunger episodes in childhood	0.008	0.58	-0.009	-0.59	0.014	1.39	0.033	1.99*
Violence exposure	-0.023	-2.48*	0.024	2.88**	0.018	1.76	0.041	4.00***
Malevolent conditions exposure	-0.015	-1.79	0.016	1.92*	0.019	1.76	0.044	3.99***
Military participation—informal	-0.023	-1.30	0.024	1.35	0.019	1.45	0.043	2.15*
Military participation—formal	-0.029	-1.40	0.031	1.46	0.029	1.60	0.068	2.75**

*$p < .05$. **$p < .01$. ***$p < .001$.

feeling younger and lessened the probability of feeling older. Respondent gender was not significantly associated with subjective age. However, relative to women, men reported significantly fewer psychological distress symptoms and more functional limitations.

Discussion and Implications

This study adopted a life course perspective to analyze subjective age within a cohort of older Vietnamese who experienced diverse adversities and stressors in childhood and young adulthood related to armed conflict. In general, the war cohort in northern Vietnam is inclined to report feeling older than their age, more so than has been observed among older adults in the United States and elsewhere (Thyagarajan et al., 2019). Results suggest that northern Vietnamese older adults' encounters with extensive and diverse stressors in early life, from episodes of severe hunger linked to material deprivation and armed conflict events such as Japanese occupation (and an associated famine in 1945), the First Indochina War (1946–54), and especially the violence and hardships of the American War, underpin their pronounced tendency to feel subjectively old. In particular, we find older adults exposed to more malevolent conditions (e.g., fear of death, food shortage, forced migration) during wartime are more likely to feel subjectively old than those less exposed, an association conveyed directly and indirectly as mediated through psychological distress. This is consistent with past research on early life adversities and subjective age which suggest that settings of deprivation and chronic stress contribute to weathering and age acceleration (Glass et al., 2023; Sun et al., 2020).

Hypothesis 1a, on war-related stressors, received partial support. War violence exposure scores did not demonstrate a positive, direct association with older subjective age. Rather, scores on the war violence exposure index were positively associated with feeling younger. Concurrently, greater war violence demonstrated significant, age-accelerating associations with higher risk BMI, functional limitations, and psychological distress. This suggests that after accounting for the ill mental and physical health effects of early life violence exposure, the remaining direct effects may lessen subjective aging. This is logically consistent with our finding that veterans of the formal military, although more likely to report psychological distress, are less likely to report feeling older than their chronological age. Collectively, results suggest that a protective buffer against feeling older may accrue to military veterans, in particular those highly exposed to war-related

violence. Plausible mechanisms include psychological factors such as a "survivor mentality" (Lee et al., 2020) that enhances a belief in one's survival against challenging odds, or unique social status and resources accorded American War veterans (Teerawichitchainan, 2009). Enduring the threats and challenges of military duty, and being recognized and lauded for one's service, may imbue survivors with a subjective youthfulness. However, veterans denied recognition or lacking social and financial capital in postwar, the benefits of service may not outweigh the physical and psychological tolls. The resilience borne out of adaptation to trauma, which may extend to Vietnamese veterans and others who witnessed and survived war violence, may act as a psychosocial resource for staving off perceived aging and the mental and physical morbidities that can exacerbate more accelerated subjective aging. Further comparative study of the psychological and social relational traits underlying stress-exposed veterans' subjective age reporting may yield insights for interventions with broader older adult populations.

Results for childhood adverse circumstances provide partial support for our third hypothesis. Respondents who experienced severe hunger on multiple occasions were more likely to report feeling older than their chronological age. This effect was both direct and indirect, as evidenced by the positive association between childhood hunger and current psychological distress. Echoing findings on early-life malnutrition and late-life subjective age observed in China and elsewhere (Xie et al., 2023; Ye et al., 2021), the experience of northern Vietnamese older adults further suggests that nutrition deprivation is one pathway through which early life adversities exert an effect upon age acceleration.

Beyond findings on childhood adversity and war-related stressors, disparities in subjective age in VHAS echo other studies' findings that current physical health conditions are highly salient to assessments of subjective age. In parallel to analyses in the United States (e.g., Prasad et al., 2022), northern Vietnamese older adults with more numerous chronic conditions are less likely to feel subjectively young and more likely to feel subjectively old. Accordingly, physical health is a powerful mediator linking early life adversity and war stressors with late-life subjective age. Functional limitations also hasten subjective aging among Vietnamese war survivors, a pattern that parallels associations in the United States and China (Prasad et al., 2023; Xie et al., 2023). Our finding that underweight individuals were significantly more likely to report older subjective age is consistent with research identifying associations between underweight BMI, morbidity, and

mortality in older adults (e.g., Grabowski and Ellis, 2001; Kvamme et al., 2010).

We observed a strong direct association between psychological distress and subjective age, hinting at an interconnectedness between self-perception of age and several dimensions of psychological wellbeing. This echoes a body of literature demonstrating subjective age's association with PTSD, depression, and other psychological morbidities (Alonso Debreczeni & Bailey, 2021). Psychological distress is further implicated in subjective age assessments because degrees of distress often reflect physical conditions and cues, such as chronic disease symptoms or experiences of bodily pain.

In settings where war-related stressors have scarred the lives of older adults, interventions that reduce the experience of late-life psychological distress and PTSD may lessen the age acceleration processes, both subjective and physiological, shown to hasten mortality and increase noncommunicable disease burden. Additionally, following Hoffman and colleagues' resource-stress model, which posits subjective age is influenced by a resource and stressor ratio (2022), and given that Vietnamese older adults have endured stressors of multiple wars and difficult sociopolitical transitions over the life course, efforts to supplement the social and material resources of older adults who have endured severe, cumulative stressors over the lifespan may support more youthful views of subjective age.

This study possesses several limitations. First, VHAS data only provide a single-item indicator of subjective age, thus offering only a unidimensional view of a multidimensional construct (Van Auken et al., 2006). Additionally, as observed in Alonso Debrezceni and Bailey's meta-analysis (2012), reliance upon cross-sectional data, like most other studies in the field, challenged causal interpretation. For example, we were ill-equipped to assess how older subjective age and psychological distress jointly influence one another bidirectionally. Furthermore, the current analyses did not permit assessment of biological processes (e.g., inflammation, HPA dysregulation) through which early life stress exposures influence older adult subjective age. Future analyses of VHAS data incorporating biomarkers of inflammation, HPA dysregulation, and other physiological processes will enhance leverage to assess specific stress-aging pathways (Thyagarajan et al., 2019).

Limitations notwithstanding, the present study illuminates the influence of early life stressors, in particular stressors of armed conflict, on subjective age. The early life adversities widely encountered in the sample (e.g., severe hunger, direct exposure to violence), whereas relatively common in conflict-affected populations, have rarely been considered in past research. The rare studies similar to VHAS, such as analyses of Korean veterans of the Vietnam War, similarly reveal that stressors spanning childhood, midlife, and late adulthood are salient for older adults' health and wellbeing (Lee et al., 2022). Because war is globally pervasive, placing billions in harm's way, including combatants and noncombatant women, children, and older adults (Bendavid et al., 2021), it is increasingly important that researchers account for the stressors of armed conflict in models predicting aging and health outcomes. Whereas war may create "embattled survivors" who weather the stressors of aging with difficulty, it may also garner a survivor's mentality among some who then exhibit a subjective sense of youth and vitality in late adulthood. Further research is warranted, in particular, to understand mechanisms underlying the positive association between violence exposure and

youthful subjective age. Recollecting that war-related service and stressors do not occur in a vacuum, but are embedded within social and economic hierarchies, future research may examine whether subjective age diverges across diverse populations of veterans, including those who diverge in terms of the (in)voluntary nature of their service, receipt of benefits and accolades, and degrees of selection into military service. Therefore, to advance the study of subjective aging, and age acceleration more broadly, we advocate a socially contextualized integration of life course stress, psychosocial, and biomedical determinants to delineate the complex pathways through which early life stress influences subjective age.

Supplementary Material

Supplementary data are available at *Innovation in Aging* online.

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Conflict of Interest

None.

Data Availability

The data and analytic methods used in this study are available to other researchers for replication purposes. Data can be accessed by completing a request at https://vhas.utah.edu/forms/data-use-proposal.php. The study reported in the manuscript was not preregistered.

References

Aldwin, C. M., Levenson, M. R., & Spiro, A. (1994). Vulnerability and resilience to combat exposure: Can stress have lifelong effects? *Psychology and Aging*, 9, 34–44. https://doi.org/10.1037//0882-7974.9.1.34

Alonso Debreczeni, F., & Bailey, P. E. (2021). A systematic review and meta-analysis of subjective age and the association with cognition, subjective well-being, and depression. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 76(3), 471–482. https://doi.org/10.1093/geronb/gbaa069

Armed Conflict Location & Event Data Project. (2023). *ACLED Conflict Index: Ranking Violent Conflict Levels Across the World*. Retrieved November 10, 2023, from https://acleddata.com/acled-conflict-index-mid-year-update/

Avidor, S., Benyamini, Y., & Solomon, Z. (2016). Subjective age and health in later life: The role of posttraumatic symptoms. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 71(3), 415–424. https://doi.org/10.1093/geronb/gbu150

Avidor, S., Levin, Y., & Solomon, Z. (2018). Guilt as a mediator between depressive symptoms and subjective age: A 17-year longitudinal study of Israeli ex-prisoners of war. *The American Journal of Orthopsychiatry*, 88(2), 199–210. https://doi.org/10.1037/ort0000212

Avidor, S., Palgi, Y., & Solomon, Z. (2017). Lower subjective life expectancy in later life is a risk factor for posttraumatic stress symptoms

among trauma survivors. *Psychological Trauma: Theory, Research, Practice and Policy*, 9(2), 198–206. https://doi.org/10.1037/tra0000182

Bachem, R., Stein, J. Y., Levin, Y., & Solomon, Z. (2019). What doesn't kill you makes you feel older: Lifespan adversity and its association with subjective age among former prisoners of war. *European Journal of Psychotraumatology*, 10(1), 1583522. https://doi.org/10.1080/20008198.2019.1583522

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, & statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182. https://doi.org/10.1037//0022-3514.51.6.1173

Bendavid, E., Boerma, T., Akseer, N., Langer, A., Malembaka, E. B., Okiro, E. A., Wise, P. H., Heft-Neal, S., Black, R. E., Bhutta, Z. A., Bhutta, Z., Black, R., Blanchet, K., Boerma, T., Gaffey, M., Langer, A., Spiegel, P., Waldman, R., & Wise, P. (2021). The effects of armed conflict on the health of women and children. *The Lancet*, 397(10273), 522–532. https://doi.org/10.1016/S0140-6736(21)00131-8

Benson, J. E. (2014). Reevaluating the "Subjective Weathering" hypothesis: Subjective aging, coping resources, and the stress process. *Journal of Health and Social Behavior*, 55(1), 73–90. https://doi.org/10.1177/0022146514521214

Bergland, A., Nicolaisen, M., & Thorsen, K. (2014). Predictors of subjective age in people aged 40–79 years: A five-year follow-up study. The impact of mastery, mental and physical health. *Aging & Mental Health*, 18(5), 653–661. https://doi.org/10.1080/13607863.2013.869545

Beusenberg, M., Orley, J. H., & World Health Organization. (1994). *A User's guide to the self-reporting questionnaire (SRQ. No. WHO/MNH/PSF/94.8.)*. World Health Organization. https://iris.who.int/handle/10665/61113. Accessed 31 May 2024.

Blau, Z. S. (1956). Changes in Status and Age Identification. *American Sociological Review*, 21(2), 198–203. https://doi.org/10.2307/2088522

Chipimo, P. J., & Fylkesnes, K. (2013). Case-finding for mental distress in primary health care: An evaluation of the performance of a five-item screening instrument. 2013. *Health*, 05, 627–636. https://doi.org/10.4236/health.2013.53a083

Cohen, A., Baker, J., & Ardern, C. I. (2016). Association between body mass index, physical activity, and health-related quality of life in Canadian adults. *Journal of Aging and Physical Activity*, 24(1), 32–38. https://doi.org/10.1123/japa.2014-0169

Costa, D. L., & Kahn, M. E. (2006). Forging a new identity: The costs and benefits of diversity in civil war combat units for black slaves and freemen. *The Journal of Economic History*, 66(4), 936–962. https://doi.org/10.1017/s0022050706000386

Creasey, H., Sulway, M. R., Psychol, M., Dent, O., Broe, G. A., Jorm, A., & Tennant, C. (1999). Is experience as a prisoner of war a risk factor for accelerated age-related illness and disability? *Journal of the American Geriatrics Society*, 47(1), 60–64. https://doi.org/10.1111/j.1532-5415.1999.tb01901.x

Dollar, D., Glewwe, P., & Litvack, J. I. (1998). *Household Welfare and Vietnam's Transition*. World Bank Publications.

Dong, Y., & Peng, C. -Y. J. (2013). Principled missing data methods for researchers. *SpringerPlus*, 2(1), 222. https://doi.org/10.1186/2193-1801-2-222

Epel, E. S., Blackburn, E. H., Lin, J., Dhabhar, F. S., Adler, N. E., Morrow, J. D., & Cawthon, R. M. (2004). Accelerated telomere shortening in response to life stress. *Proceedings of the National Academy of Sciences*, 101(49), 17312–17315. https://doi.org/10.1073/pnas.0407162101

Fontana, A., & Rosenheck, R. (1999). A model of war zone stressors and posttraumatic stress disorder. *Journal of Traumatic Stress*, 12(1), 111–126. https://doi.org/10.1023/A:1024750417154

Grabowski, D. C., & Ellis, J. E. (2001). High body mass index does not predict mortality in older people: Analysis of the longitudinal study of aging. *Journal of the American Geriatrics Society*, 49(7), 968–979. https://doi.org/10.1046/j.1532-5415.2001.49189.x

Glass, D. J., Young, Y. M., Tran, T. K., Clarkin, P., & Korinek, K. (2023). Weathering within war: Somatic health complaints among Vietnamese older adults exposed to bombing and violence as adolescents in the American war. *Journal of Psychosomatic Research*, 165, 111080.

Guillemot, F. (2009). Death and suffering at first hand: Youth shock brigades during the Vietnam War (1950—1975). *Journal of Vietnamese Studies*, 4(3), 17–60. https://doi.org/10.1525/vs.2009.4.3.17

Gunn, G. C. (2011). The Great Vietnamese famine of 1944-45 revisited. *The Asia-Pacific Journal*, 52, 81–105. http://hdl.handle.net/10069/25151

Han, C., & Hong, Y. -C. (2019). Fetal and childhood malnutrition during the Korean War and metabolic syndrome in adulthood. *Nutrition*, 62, 186–193. https://doi.org/10.1016/j.nut.2019.01.003

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*.

Huang, C. S. (2013). Undergraduate students' knowledge about aging and attitudes toward older adults in east and west: A socio-economic and cultural exploration. *International Journal of Aging & Human Development*, 77(1), 59–76. https://doi.org/10.2190/AG.77.1.d

Hubbard, R. E., Lang, I. A., Llewellyn, D. J., & Rockwood, K. (2010). Frailty, body mass index, and abdominal obesity in older people. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 65(4), 377–381. https://doi.org/10.1093/gerona/glp186

Hubley, A. M., & Russell, L. B. (2009). Prediction of subjective age, desired age, and age satisfaction in older adults: Do some health dimensions contribute more than others? *International Journal of Behavioral Development*, 33(1), 12–21. https://doi.org/10.1177/0165025408099486

Hwang, Y., & Hong, G. -R. S. (2019). Predictors of subjective age in community-dwelling older adults in Korea. *Geriatric Nursing (New York, N.Y.)*, 40(3), 314–319. https://doi.org/10.1016/j.gerinurse.2018.11.008

Kang, S., Aldwin, C. M., Choun, S., & Spiro III, A. (2016). A life-span perspective on combat exposure and PTSD symptoms in later life: Findings from the VA Normative Aging Study. *The Gerontologist*, 56(1), 22–32.

Keane, T., Fairbank, J., Caddell, J., Zimering, R., Taylor, K., & Mora, C. (1989). Clinical evaluation of a measure to assess combat exposure. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 1, 53–55. https://doi.org/10.1037/1040-3590.1.1.53

Kim, D. S., Chung, H. G., Choi, J. H., So, H. S., Kim, H. J., Go, C. M., Kim, T. Y., & Chung, M. Y. (2012). Reliability and validity of the Korean version of the combat exposure scale. *Anxiety and Mood*, 8(2), 106–112. https://koreascience.kr/article/JAKO201228066505045.page

King, L. A., King, D. W., Fairbank, J. A., Keane, T. M., & Adams, G. A. (1998). Resilience–recovery factors in post-traumatic stress disorder among female and male Vietnam veterans: Hardiness, postwar social support, and additional stressful life events. *Journal of Personality and Social Psychology*, 74, 420–434. https://doi.org/10.1037//0022-3514.74.2.420

King, L. A., King, D. W., Vogt, D. S., Knight, J., & Samper, R. E. (2006). Deployment risk and resilience inventory: A collection of measures for studying deployment-related experiences of military personnel and veterans. *Military Psychology*, 18(2), 89–120. https://doi.org/10.1207/s15327876mp1802_1

Korinek, K., Teerawichitchainan, B., Zimmer, Z., Brindle, E., Nguyen, T. K. C., Nguyen, H. M., & Tran, K. T. (2019). Design and measurement in a study of war exposure, health, and aging: Protocol for the Vietnam health and aging study. *BMC Public Health*, 19(1), 1351. https://doi.org/10.1186/s12889-019-7680-6

Korinek, K., Young, Y., Teerawichitchainan, B., Kim Chuc, N. T., Kovnick, M., & Zimmer, Z. (2020). Is war hard on the heart? Gender, wartime stress and late life cardiovascular conditions in a population of Vietnamese older adults. *Social Science & Medicine (1982)*, 265, 113380. https://doi.org/10.1016/j.socscimed.2020.113380

Kovnick, M. O., Young, Y., Tran, N., Teerawichitchainan, B., Tran, T. K., & Korinek, K. (2021). The impact of early life war exposure on mental health among older adults in Northern and Central Vietnam. *Journal of Health and Social Behavior*, 62(4), 526–544. https://doi.org/10.1177/00221465211039239

Kvamme, J. -M., Olsen, J. A., Florholmen, J., & Jacobsen, B. K. (2011). Risk of malnutrition and health-related quality of life in community-living elderly men and women: The Tromsø study. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, 20(4), 575–582. https://doi.org/10.1007/s11136-010-9788-0

Kvamme, J. M., Wilsgaard, T., Florholmen, J., & Jacobsen, B. K. (2010). Body mass index and disease burden in elderly men and women: The Tromsø Study. *European Journal of Epidemiology*, 25, 183–193. https://doi.org/10.1007/s10654-009-9422-z

Lee, H., Kang, S., Choun, S., Lee, D., Lee, H. -S., & Aldwin, C. M. (2022). Life satisfaction of Korean Vietnam War Veterans in later life: A lifespan approach. *Military Psychology*, 34(1), 1–11. https://doi.org/10.1080/08995605.2021.1962193

Lee, W. E. (2007). Mind and matter—cultural analysis in American Military history: A look at the state of the field. *Journal of American History*, 93(4), 1116–1142. https://doi.org/10.2307/25094598

Lee, Y. Y., Verma, S., & Subramaniam, M. (2020). Beyond recovery: Exploring growth in the aftermath of psychosis. *Frontiers in Psychiatry*, 11, 11. https://doi.org/10.3389/fpsyt.2020.00108

Liang, K. (2014). The cross-domain correlates of subjective age in Chinese oldest-old. *Aging & Mental Health*, 18(2), 217–224. https://doi.org/10.1080/13607863.2013.823377

Ly, K. A., Ton, T. G., Ngo, Q. V., Vo, T. T., & Fitzpatrick, A. L. (2013). Double burden: A cross-sectional survey assessing factors associated with underweight and overweight status in Danang, Vietnam. *BMC Public Health*, 13(1), 35. https://doi.org/10.1186/1471-2458-13-35

Mathur, A., & Moschis, G. P. (2005). Antecedents of cognitive age: A replication and extension. *Psychology and Marketing*, 22(12), 969–994. https://doi.org/10.1002/mar.20094

Medeiros, R. (2016). *Handling missing data in Stata: Imputation & likelihood-based approaches*. 33. https://www.stata.com/meeting/switzerland16/slides/medeiros-switzerland16.pdf

Miguel, E., & Roland, G. (2011). The long-run impact of bombing Vietnam. *Journal of Development Economics*, 96(1), 1–15. https://doi.org/10.1016/j.jdeveco.2010.07.004

Palgi, Y., Shrira, A., Avidor, S., Hoffman, Y., Bodner, E., & Ben-Ezra, M. (2019). Understanding the long-term connections between posttraumatic stress, subjective age, and successful aging among midlife and older adults. *European Journal of Psychotraumatology*, 10(1), 1583523. https://doi.org/10.1080/20008198.2019.1583523

Pearlin, L. I., Schieman, S., Fazio, E. M., & Meersman, S. C. (2005). Stress, health, and the life course: some conceptual perspectives. *Journal of Health and Social Behavior*, 46(2), 205–219. https://doi.org/10.1177/002214650504600206

Porter, G. (1993). *Vietnam: The politics of bureaucratic socialism*. Cornell University Press.

Prasad, A., Miller, E. A., Burr, J. A., & Boerner, K. (2022). Diagnoses of chronic health conditions and change in subjective age: The moderating role of chronological age. *The Gerontologist*, 62(2), 276–285. https://doi.org/10.1093/geront/gnab057

Prasad, A., Shellito, N., Alan Miller, E., & Burr, J. A. (2023). Association of chronic diseases and functional limitations with subjective age: The mediating role of sense of control. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 78(1), 10–19. https://doi.org/10.1093/geronb/gbac121

Preacher, K.J., & Leonardelli, G.J. (n.d.). Calculation for the Sobel test: An interactive calculation tool for mediation tests. Retrieved November 13, 2023, from https://quantpsy.org/sobel/sobel

Reijnierse, E. M., Trappenburg, M. C., Leter, M. J., Blauw, G. J., De Van Der Schueren, M. A. E., Meskers, C. G. M., & Maier, A. B. (2015). The association between parameters of malnutrition and diagnostic measures of sarcopenia in geriatric outpatients. *PLoS One*, 10(8), e0135933. https://doi.org/10.1371/journal.pone.0135933

Richardson, L. K., Amstadter, A. B., Kilpatrick, D. G., Gaboury, M. T., Luong Tran, T., Trung, L. T., Thanh Tam, N., Tuan, T., Buoi, La Thi, Ha, T. T., Thach, T. D., & Acierno, R. (2010). "Estimating mental distress in Vietnam: the use of the SRQ-20." *International Journal of Social Psychiatry*, 56(2), 133–142. https://doi.org//10.1177/0020764008099554

Schafer, M. H. (2009). Parental death and subjective age: Indelible imprints from early in the life course? *Sociological Inquiry*, 79(1), 75–97. https://doi.org/10.1111/j.1475-682x.2008.00270.x

Schorr, V. A., Yehuda, I., & Tamir, S. (2021). Loneliness, malnutrition and change in subjective age among older adults during COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18(1), 106. https://doi.org/10.3390/ijerph18010106

Shrira, A., Palgi, Y., Ben-Ezra, M., & Shmotkin, D. (2011). Transgenerational effects of trauma in midlife: Evidence for resilience and vulnerability in offspring of Holocaust survivors. *Psychological Trauma: Theory, Research, Practice and Policy*, 3(4), 394–402. https://doi.org/10.1037/a0020608

Solomon, Z., Greene, T., Ein-Dor, T., Zerach, G., Benyamini, Y., & Ohry, A. (2014). The long-term implications of war captivity for mortality and health. *Journal of Behavioral Medicine*, 37(5), 849–859. https://doi.org/10.1007/s10865-013-9544-3

Solomon, Z., Helvitz, H., & Zerach, G. (2009). Subjective age, PTSD and physical health among war veterans. *Aging & Mental Health*, 13(3), 405–413. https://doi.org/10.1080/13607860802459856

StataCorp. 2021. *Stata Statistical Software: Release 17*. College Station, TX: StataCorp LLC.

Stephan, Y., Sutin, A. R., & Terracciano, A. (2015). How old do you feel? The role of age discrimination and biological aging in subjective age. *PLoS One*, 10(3), e0119293. https://doi.org/10.1371/journal.pone.0119293

Sun, Y., Fang, J., Wan, Y., Su, P., & Tao, F. (2020). Association of early-life adversity with measures of accelerated biological aging among children in China. *JAMA Network Open*, 3(9), e2013588. https://doi.org/10.1001/jamanetworkopen.2020.13588

Teerawichitchainan, B. (2009). Trends in Military Service in Northern Vietnam, 1950–1995: A sociodemographic approach. *Journal of Vietnamese Studies*, 4(3), 61–97. https://doi.org/10.1525/vs.2009.4.3.61

Terracciano, A., Stephan, Y., Aschwanden, D., Lee, J. H., Sesker, A. A., Strickhouser, J. E., Luchetti, M., & Sutin, A. R. (2021). Changes in subjective age during COVID-19. *The Gerontologist*, 61(1), 13–22. https://doi.org/10.1093/geront/gnaa104

Thyagarajan, B., Shippee, N., Parsons, H., Vivek, S., Crimmins, E., Faul, J., & Shippee, T. (2019). How does subjective age get "under the skin?" The association between biomarkers and feeling older or younger than one's age: The health and retirement study. *Innovation in Aging*, 3(4), igz035. https://doi.org/10.1093/geroni/igz035

Tibubos, A. N., Burghardt, J., Klein, E. M., Brähler, E., Jünger, C., Michal, M., Wiltink, J., Wild, P. S., Münzel, T., Singer, S., Pfeiffer, N., & Beutel, M. E. (2021). Frequency of stressful life events and associations with mental health and general subjective health in the general population. *Journal of Public Health*, 29(5), 1071–1080. https://doi.org/10.1007/s10389-020-01204-3

van Abeelen, A. F., Elias, S. G., Bossuyt, P. M., Grobbee, D. E., van der Schouw, Y. T., Roseboom, T. J., & Uiterwaal, C. S. (2012). Cardiovascular consequences of famine in the young. *European Heart Journal*, 33(4), 538–545. https://doi.org/10.1093/eurheartj/ehr228. https://academic.oup.com/eurheartj/article/33/4/538/477581

Van Abeelen, A. F. M., Elias, S. G., De Jong, P. A., Grobbee, D. E., Bossuyt, P. M. M., Van Der Schouw, Y. T., Roseboom, T. J., & Uiterwaal, C. S. P. M. (2013). Famine in the young and risk of later hospitalization for COPD and asthma. *PLoS One*, 8(12), e82636. https://doi.org/10.1371/journal.pone.0082636

Van Auken, S., Barry, T. E., & Bagozzi, R. P. (2006). A cross-country construct validation of cognitive age. *Journal of the Academy*

of Marketing Science, 34(3), 439–455. https://doi.org/10.1177/0092070304270996

Velaithan, V., Tan, M. M., Yu, T. F., Liem, A., Teh, P. L., & Su, T. T. (2023). The association of self-perception of ageing and quality of life in older adults: A systematic review. *The Gerontologist*, 64, gnad041. https://doi.org/10.1093/geront/gnad041

WHO Expert Consultation (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*, 363(9403), 157. https://doi.org/10.1016/s0140-6736(03)15268-3

Witter, S. (1996). 'Doi Moi' and health: The effect of economic reforms on the health system in Vietnam. *The International Journal of Health Planning and Management*, 11(2), 159–172. https://doi.org/10.1002/(SICI)1099-1751(199604)11:2<159::AID-HPM427>3.0.CO;2-9

Wurm, S., & Westerhof, G. J. (2015). Longitudinal research on subjective aging, health, and longevity: Current evidence and new directions for research. *Annual Review of Gerontology and Geriatrics*, 35(1), 145–165. https://doi.org/10.1891/0198-8794.35.145

Xie, D., Wang, J., & Huang, F. (2023). The role of adverse childhood experiences in multidimensional nature of subjective age. *The Journals of Gerontology: Series B*, 78(2), 230–241. https://doi.org/10.1093/geronb/gbac160

Yang, M. S., Quach, L., Lee, L. O., Spiro, A., & Burr, J. A. (2022). Subjective well-being among male veterans in later life: The enduring effects of early life adversity. *Aging & Mental Health*, 26(1), 107–115. https://doi.org/10.1080/13607863.2020.1842999.

Ye, C., Aihemaitijiang, S., Wang, R., Halimulati, M., & Zhang, Z. (2021). Associations between early-life food deprivation and risk of frailty of middle-age and elderly people: Evidence from the China health and retirement longitudinal study. *Nutrients*, 13(9), 3066. https://doi.org/10.3390/nu13093066

Ying, B., & Yao, R. (2010). Self-perceived age and attitudes toward marketing of older consumers in China. *Journal of Family and Economic Issues*, 31(3), 318–327. https://doi.org/10.1007/s10834-010-9199-y

Young, Y., Korinek, K., Zimmer, Z., & Tran, K. T. (2021). Assessing exposure to war-related traumatic events in older Vietnamese War Survivors. *Conflict and Health*, 15(14), 1–16. https://doi.org/10.1186/s13031-021-00343-y

Zimmer, Z., Korinek, K., Young, Y., Teerawichitchainan, B., & Toan, T. K. (2022). Early-life war exposure and later-life frailty among older adults in Vietnam: Does war hasten aging? *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 77(9), 1674–1685. https://doi.org/10.1093/geronb/gbab190