Subsidized Versus Unsubsidized Senior Housing Communities in PA: A Window on Variation in Health, Function, and Access to Services in Old Age

Janelle J. Christensen, PhD, MPH, MA[1] (ID), **Steven M. Albert, PhD, MS**[1], **Subashan Perera, PhD**[1], **Jennifer S. Brach, PhD, PT**[1] (ID), **David A. Nace, MD, MPH**[1], **Neil M. Resnick, MD**[1], and **Susan L. Greenspan, MD**[1]

Abstract

Introduction: Independent Living residences for older adults can be divided into two categories and require better definitions for research purposes; the purpose of this manuscript is to provide those definitions and explore variation in provided services and resident characteristics: (a) *Subsidized* age-based housing (55+) (Department of Housing and Urban Development (HUD) housing units for low-income adults), and (b) *non-subsidized* age-based housing. **Methods:** Residents in the two settings were compared: 37 subsidized locations (p = 289 residents) and 19 non-subsidized (p = 208). Aging support services in each housing type were quantified. **Results:** Subsidized residents are more likely to be female (84.6% vs. 70.2%, p = .0002) and have fair-poor health (36.5% vs. 12.5%, p < .0001), frequent pain (28.4% vs. 12.8%, p < .0001), and fair-poor mobility (37.5% vs. 23.5%, p = .0298). Non-subsidized locations are more likely to offer support services; on average, residents are older (mean age 83vs. 75; p < .0001) and white (97.6% vs. 69.2%, p < .0001). **Conclusion:** Significant differences exist between populations living in subsidized and non-subsidized housing, suggesting the effect of cumulative disadvantage over the lifespan; populations in poorer health have access to fewer services. Research is needed to explore generalizability on a national level.

Keywords

long-term care, social determinants of health, mortality, health care disparity, race/ethnicity

Manuscript received: February 26, 2024; **final revision received:** May 22, 2024; **accepted:** June 28, 2024.

Introduction

Allegheny County, Pennsylvania, has the second largest population over age 65 in the United States, behind Palm Beach County, Florida (Beach et al., 2022). With 20.4% of Allegheny County being 65 or older, there is an increased need for appropriate age-friendly accommodations in housing, health care provision, and targeted research opportunities (United States Census Bureau, Allegheny County, Pennsylvania, 2022) The high proportion of older adults makes Allegheny County and surrounding areas a prime location for exploring different housing options for older adults.

Considering housing options for older adults is important because, while most people in later life prefer to age in their own homes (Kasper et al., 2019; Lehnert et al., 2019), the older nature of the housing stock in the U.S.

(Allegheny County in particular) means few homes are built to accommodate age-related impairments or disability, such as ramps or accessible bathrooms (Beach et al., 2022; Vespa et al., 2020). Of the people over age 65 living in Allegheny County, 33.1% or 74,000 reported at least one disability (Beach et al., 2022). Older adults with disabilities often consider relocating to housing options that facilitate aging in place (age-friendly accommodations, such as accessible bathrooms and elevators) or that options that allow for access to a continuum of care on a

[1]University of Pittsburgh, Pittsburgh, PA, USA

Corresponding Author:
Janelle J. Christensen, Division of Geriatric Medicine, Department of Medicine, University of Pittsburgh, Kaufmann Medical Building, Suite 500, 3471 Fifth Avenue, Pittsburgh, PA 15213, USA.
Email: jjc157@pitt.edu

single campus site (National Institute of Aging, 2023). They may also seek locations that provide transportation due to documented barriers to transportation, especially for those with disabilities (Mwaka et al., 2023). There are several different types of housing that can fall along the continuum of care for older adults as they consider age-friendly housing options.

Traditionally, the continuum of care includes one's private home (including private apartments) in the community, Independent Living Facilities which may are may not offer supportive services, Assisted Living Facilities (ALFs) providing non-skilled residential services, and skilled nursing facilities (SNFs) designed for individuals having substantial cognitive and/or functional impairments (Freedman & Spillman, 2014; AARP, 2022; Chum et al.,2022; National Institute of Aging, 2023). A more significant financial burden comes with each higher level of care (Pearson et al., 2019). To address the high costs of age-friendly housing, some locations are subsidized by the U.S. Department of Housing and Urban Development (HUD) to provide limited enhanced services to older adults. The Section 202 Supportive Housing for the Elderly program was established in 1959 and continues to aid low-income people over age 62 and those with disabilities (Perl & McCarty, 2017). There is limited research that outlines the number of services in these subsidized locations compared to their non-subsidized counterparts and even less research on the demographics or health characteristics of the residents.

Research Registry

In this study, we use data from the [Anonymized University name] *Research Registry*, which enrolled older adults over the age of 55 and residing in senior living residences in the greater Pittsburgh area, to: (1) define types of independent living residences based on presence of HUD subsidization as well as number of supportive services offered; and (2) compare the demographic and health characteristics of those residing in different independent living residences. We hypothesized that exploring the differences between these age-based housing types is important because they potentially serve different populations, divided by income, socioeconomic factors, and possibly health indicators. If these housing types serve different populations, those factors should be considered during research design and recruitment.

Independent Age-Based Housing Residence Types

Though less often explored in the literature than ALFs or SNFs, Independent living options that are attractive (and possibly necessary) for older adults (Freedman & Spillman, 2014). We argue that independent living

community arrangements for older adults can be broadly divided into two categories for research purposes: (a) subsidized age-based housing (federally subsidized housing units for low-income adults) and (b) non-subsidized age-based housing (units designated for older adults that may be stand-alone or part of multi-level campuses) that usually offer four or more aging support services (i.e., prepared meals, structured social activities, transportation to medical appointments and groceries, and housekeeping) to residents. Locations not intentionally designed as retirement or senior living communities but with a "large proportion of older persons residing within a specified geographic area" are sometimes called a Naturally Occurring Retirement Community or NORC (Colello, 2007, p. 1). Though some NORCs have been targeted for enhanced services, they are distinguished from the *intentional* housing structure of subsidized and non-subsidized age-based housing. Though important to understand what makes them unique from a policy and research perspective, this study does not include NORCs.

Below, we define subsidized age-based housing and compare it to non-subsidized age-based housing communities in national and local contexts.

Subsidized Age-Based Housing in a National Context

Subsidized age-based housing, in general, is low-income, age-based housing subsidized by the U.S. Department of Housing and Urban Development (HUD) that provides limited enhanced residential services to older adults. A 2017 congressional report documents that 350,000 Section 202 units are available to older adults (over 62 and younger for those with disabilities) in the United States (Perl & McCarty, 2017). Housing costs must be >30% of the annual household income to qualify for HUD housing. According to a 2017 HUD congressional report, the average annual household income for Section 202 households was approximately $13,300, making subsidized monthly rent approximately $325 (30% of the annual income; Couch, 2019). As of 2019, there were 2.2 million households headed by someone older than 62 years of age who met the definition of "worst case housing," defined as renters with very low income ("income of no more than 50% of the area median income") who do not receive housing assistance (Alvarez & Barry, 2021, p. 2). Estimates from HUD show that only about 34% of the older adults eligible for rental assistance apply and receive support (Couch, 2019).

Subsidized Housing Age-Based Housing Local Context

Information on subsidized age-based housing from the Allegheny County Department of Health and Human Services notes that 80% of the housing is available

through privately owned and operated buildings (Allegheny County Housing Information Guide for Senior Adults, 2021). Twelve buildings are available through the Housing Authority of City of Pittsburgh, 16 through the Allegheny County Housing Authority, 5 through McKeesport Housing Authority, and 147 buildings with a private landlord holding a contract with HUD. The Allegheny Housing Authorities and Housing Authority of the City of Pittsburgh may both assist with Section 202 housing but they also manage other city and/or county subsidized housing programs (including Section 8/ "The Housing Choice Voucher Program" and a "Low-income Housing program").

Previous research in the Pittsburgh area looked at the impact of enhanced services in subsidized age-based housing that had 20 or more units (Anonymized for Review #1, 2016). The authors found that residents significantly benefited from the enhanced service programs. Based on the findings, the [Anonymized] Research Registry began recruiting subsidized age-based housing residents in 2017 alongside non-subsidized age-based housing residents.

Non-subsidized Age-Based Housing: National Context

Non-subsidized age-based housing sites are age-based, service-rich buildings (often including prepared meals, on-site social events, and transportation to shopping and/or medical appointments) intentionally designed to serve older adults. Non-subsidized age-based housing sites may be further divided into two different subtypes: (1) standalone independent housing; (2) independent housing that is, part of a multi-level campus such as a continuing care retirement communities (CCRCs). Major distinguishing factors include the fact that standalone independent housing does not require licensing, while CCRC's do require licensing (which makes them easier to track at national levels). The standalone unsubsidized age-restricted housing and the independent living level of CCRC's both function as independent apartments but with extensive age-friendly services (see Table 2 for examples for commonly offered services).

Miller et al. (2023) use 2019 National Investment Center (NIC-MAP) data to describe prevalence and trends in different facility types, including CCRCs and stand-alone independent living facilities. Notably, their research excluded "retirement communities" and "senior apartments," neither of which are clearly defined; it is possible that "senior apartments" are what we call "subsidized age-based housing." They reported that in 2019, there were 1,851 CCRCs and 1,523 stand-alone independent living facilities in the United States (Miller et al., 2023).

More recent 2022 data from the National Investment Center for Seniors Housing & Caretracks (NIC-MAP) CCRCs and occupancy rates and reported a slightly lower number than Miller et al. (2023):1,173 CCRCs, representing 203,515 Independent Living units in 2022 (Zahraoui, 2022). The average monthly rent for unsubsidized independent living in CCRC licensed communities at this time was $3,650, not including possible entry fees (Zahraoui, 2022).

Regardless of number, Miller et al. ultimately worked to categorize services provided at different levels of care available for older adults in different levels of age-based housing. They also found that, though the supply of "senior housing communities increased substantially. . . [they] have not necessarily kept up with population growth" at the national level (2022; pp 101). Though they looked at the level of care and Medicaid reimbursement policies, they did not pair the different types of housing with resident health data.

Non-Subsidized Age-Based Housing: Local Context

The Greater Pittsburgh Area (including Allegheny County and the surrounding four counties) has a total of 43 CCRCs (Allegheny 26; Butler 8; Westmoreland 6; Washington 3; Beaver 0). According to the Pennsylvania Insurance Department, "only those communities which charge large upfront entrance fees are regulated by the Insurance Department" (Continuing Care Retirement Facility Search, Pennsylvania Insurance Department, 2023). Since stand alone Independent Living facilities re not regulated by the Commonwealth, the total number of such facilities cannot be readily quantified.

Income and Housing: Cumulative Inequality Theory

Cumulative Inequality (CI), according to Ferraro and Shippee (2009), is the additive damage that a person acquires over the lifespan due to social inequality. The five axioms of CI theory are:

1. Social systems generate inequality, manifested over the life course through demographic and developmental processes.
2. Disadvantage increases exposure to risk, but advantage increases exposure to opportunity.
3. The accumulation of risk, available resources, and human agency shape life course trajectories.
4. The perception of life trajectories influences subsequent trajectories.
5. Cumulative inequality may lead to premature mortality; therefore, nonrandom selection may give the appearance of decreasing inequality in later life.

Social inequality can impact genetic expression (via epigenetics) over the lifespan, including gestation (via access to nutrition or exposure to toxins), which may

lead to differential health outcomes as a person ages. Indeed, theorist Beck (1986, 35) puts it most clearly: "Poverty attracts an unfortunate abundance of risks. By contrast, the wealthy (in income, power or education) can purchase safety and freedom from risk". Research on housing and disaster management has explored the accumulation of risk and vulnerability within and between different housing types (Anonymized for Review #2, 2018).

Health disparities exist among historically disadvantaged populations, notably among black Americans (Fenelon, 2024; Ferraro et al., 2017). Research on allostatic load has suggested that socioeconomic status alone does not explain health disparities among black Americans, as higher morbidity rates persist even with adjustment for income and education (Duru et al., 2012; Thomas Tobin & Hargrove, 2022). However, redlining and historically segregated employment in some areas of the United States have had an unfortunate legacy of differential access to services and more exposure to risks (as exemplified by the COVID-19 pandemic; Hill & Farrell, 2022; McClymonds et al., 2022; Zimmerman et al., 2022). We posit that disadvantages accumulated over a lifespan can be carried forward into residential settings in older age.

Current Study. The [Anonymized] Center maintains the [Anonymized] Registry (established in 2013), consisting of people over age 55, living in age-based housing or participating in Adult Day Services in the greater Pittsburgh area. While the registry was first recruited from UPMC-affiliated Senior Living Communities, the sample was expanded in 2017 to include HUD-subsidized age-based housing. We sought to describe the [Anonymized] Registry participants, subsidized age-based housing, and non-subsidized age-based housing communities in which they reside to inform and aid others considering participant recruitment from such settings and highlight any differences. We also examine whether any differences between the site types are independent of known risk factors such as age, gender, and race.

Methods

Study Participants

The [Anonymized] Center developed a comprehensive research network by working with age-based housing -restricted housing owners and service coordinators. Facilities agreeing to participate provided letters of support in accordance with [Anonymized] Institutional Review Board (IRB) protocol and Pennsylvania law (28 Pa. Code § 201.29. Resident rights, 2023) and allowed onsite recruitment of potential registry participants. Recruited older adults were willing to be invited to participate in [Anonymized] research studies. Starting in 2017, the [Anonymized] Center expanded recruitment into the registry to include residents of HUD-subsidized age-based housing settings. The goal of the expansion was to make research opportunities and accompanying benefits available to populations that have been historically excluded from research.

Residence Types

To compare services available in subsidized age-based housing and non-subsidized age-based housing settings, we collected information from site managers and websites to determine the availability of six on-site services: housekeeping, on-site meals (at least one meal a day provided to residents), social activities, transportation (dedicated transport for groceries or medical appointments), linen services and/ or laundry, and personal assistance including help managing medications and assistance with bathing. Though the [Anonymized] Research Registry includes participants in ALF and SNFs, they were excluded from this study.

Resident Measures

The [Blinded] Research Registry Questionnaire collects basic demographic information, such as date of birth, gender, race, and ethnicity. As the goal of the registry is to connect people to research studies that fit their health and background, the intake questionnaire also asks participants to provide information on their health status and behaviors. Participants rate their health, balance, mobility, daily symptoms, and the presence of impairment or disabilities. They also report if a physician has ever told them that they have diabetes, osteoporosis, arthritis, vision or hearing problems, high blood pressure, anxiety, depression, a stroke, congestive heart failure, or pulmonary disease (COPD), and related disorders. The present report documents differences between the two settings and their residents, including mortality risk over up to 5 years of follow-up.

Data Analysis

We used appropriate descriptive statistics to summarize facility and resident characteristics. Independent samples *t*-, chi-square and Fisher's exact tests, as appropriate, were used to compare the settings. To *describe* the differences between the two types of settings, we fitted logistic regression models with each dichotomous health and function measure as the dependent variable and setting (subsidized /non-subsidized age-based housing) as the sole independent variable. The odds ratios, 95% confidence intervals, and *p*-values were used to quantify the differences descriptively and inferentially. To examine whether such differences were *independent* of known risk factors, we repeated the logistic regression models with age, gender, and Caucasian race as covariates. Finally, we constructed Kaplan-Meier survival curves to examine mortality risk and used Cox proportional hazards regression models to analyze time to death right

Table 1. Participant Characteristics: *N* (%) or Mean ± Standard Deviation.

	Subsidized age-based housing (N = 208)	Unsubsidized age-based housing (N = 289)	*p*-Value
Year consented			<.0001
2017	23 (11.1)	169 (58.5)	
2018	95 (45.7)	49 (17.0)	
2019	69 (33.2)	29 (10.0)	
2020	13 (6.3)	16 (5.5)	
2021	0 (0.0)	0 (0.0)	
2022	8 (3.9)	26 (9.0)	
Gender			.0002
Male	32 (15.4)	86 (29.8)	
Female	176 (84.6)	203 (70.2)	
Race			
Caucasian	144 (69.2)	282 (97.6)	<.0001
African American	52 (25.0)	4 (1.4)	<.0001
Asian	2 (1.0)	2 (0.7)	1.0000
Other	10 (4.8)	1 (0.4)	.0010
Age	74.6 ± 8.4	83.4 ± 6.9	<.0001

censored on 12/31/2022. Statistical analyses were conducted using SAS® version 9.4 (SAS Institute, Inc., Cary, North Carolina).

Results

Facility Characteristics

Between 6/1/17 and 12/31/22, 497 older adults from 56 residence sites joined the [Anonymized] Registry. Participants resided in 19 non-subsidized age-based housing sites (*n* = 207) and 37 subsidized age-based housing sites (*n* = 289). Table 1 details recruitment over the enrollment period by type of site. Seventy-six deaths were recorded through 12/31/22.

Consistent with the defining features of the residence types, non-subsidized age-based housing sites offered at least four on-site services. As shown in Table 2, no subsidized age-based housing offered more than three of the six services tracked (personal assistance care, housekeeping, meals, transportation, social activities, laundry), and the majority offered only one. Across the subsidized age-based housing sites, 86.5% provided social services referrals or linkage, and 13.5% provided transportation services. Less than 6% provided any of the other four services. In the non-subsidized age-based housing sites, virtually all sites provided meals, social services, and transportation, and about 90% provided each of the three other services.

Resident Characteristics: Differences by Housing Type

Resident demographics differed substantially across the two residence types (Table 1). Residents of the non-subsidized age-based housing sites were more likely to be

Table 2. Aging Support Services Offered on Site: *N* (%).

	Subsidized age-based housing (N = 37)	Unsubsidized age-based living (N = 19)
Type of service		
Housekeeping	1 (2.7)	17 (89.5)
Nursing	1 (2.7)	17 (89.5)
Meals	1 (2.7)	18 (94.7)
Social services	32 (86.5)	19 (100.0)
Transport	5 (13.5)	10 (100.0)
Laundry	2 (5.4)	17 (89.5)
Number of services offered		
0	4 (10.8)	0 (0.0)
1	25 (67.6)	0 (0.0)
2	7 (18.9)	0 (0.0)
3	1 (2.7)	1 (5.3)
4	0 (0.0)	2 (10.5)
5	0 (0.0)	0 (0.0)
6	0 (0.0)	16 (84.2)

Count of available services offered in each housing type, 0 services to 6 services: nursing or personal assistance care, housekeeping, meals, transportation, social activities, laundry, or linen service.

older (mean ± standard deviation 83.4 ± 6.9 vs. 74.6 ± 8.4, *p* < .0001) and white (97.6% vs. 69.2%, *p* < .0001). Subsidized age-based housing residents were more likely to be female (84.6% vs. 70.2%; *p* = .0002).

As shown in Table 3, subsidized age-based housing residents reported poorer health, greater morbidity and disability, and unhealthy behaviors. They were more likely to report fair or poor mobility (37.5% vs. 23.5%, odds ratio or OR [95% CI] 1.97 [1.33–2.91]; *p* = .0007). They were more likely to report hypertension (71.2% vs. 59.2%, OR 1.70 [1.16–2.49]; *p* = .0062) but less a history

Table 3. Pain, Balance/Mobility, Morbidity and Health Status/Behaviors.

	Subsidized age-based housing (N = 208), n (%)	Unsubsidized age-based housing (N = 289), n (%)	Unadjusted		Adjusted	
			Odds Ratio (95% CI)	p- Value	Odds Ratio (95% CI)	p- Value
Pain						
Head/neck/shoulders	55 (26.4)	47 (16.3)	1.85 (1.19–2.87)	.0060	1.71 (1.01–2.90)	.0453
Hips	44 (21.2)	29 (10.0)	2.41 (1.45–4.00)	.0007	2.23 (1.21–4.12)	.0100
Back	100 (48.1)	94 (32.5)	1.92 (1.33–2.77)	.0005	1.77 (1.13–2.77)	.0121
Knees	51 (24.5)	49 (17.0)	1.59 (1.02–2.47)	.0389	1.30 (0.76–2.22)	.3485
Ankles	23 (11.1)	8 (2.8)	4.37 (1.91–9.97)	.0005	3.45 (1.32–9.04)	.0119
Hands/fingers	33 (15.9)	13 (4.5)	4.00 (2.05–7.82)	<.0001	3.85 (1.76–8.43)	.0007
Toes/feet	35 (16.8)	17 (5.9)	3.24 (1.76–5.96)	.0002	2.96 (1.42–6.18)	.0039
Legs	52 (25.0)	30 (10.4)	2.88 (1.76–4.70)	<.0001	2.34 (1.29–4.24)	.0050
Arms	26 (12.5)	7 (2.4)	5.76 (2.45–13.5)	<.0001	4.99 (1.87–13.3)	.0014
Frequent pain	59 (28.4)	37 (12.8)	2.70 (1.71–4.26)	<.0001	2.33 (1.34–4.04)	.0026
Balance/mobility						
Assistive device use	109 (52.4)	129 (44.6)	1.37 (0.96–1.95)	.0876	1.48 (0.95–2.30)	.0824
Wheelchair use	7 (3.4)	3 (1.0)	3.32 (0.85–13.0)	.0848	3.63 (0.74–17.7)	.1110
Motorized scooter use	15 (7.2)	18 (6.2)	1.17 (0.58–2.38)	.6643	0.90 (0.36–2.26)	.8260
Walker use	14 (6.7)	21 (7.3)	0.92 (0.46–1.86)	.8179	1.44 (0.62–3.34)	.3988
Rollator use	49 (23.6)	67 (23.2)	1.02 (0.67–1.56)	.9224	1.06 (0.63–1.79)	.8184
Cane use	60 (28.9)	67 (23.2)	1.34 (0.90–2.02)	.1540	1.21 (0.73–2.01)	.4718
Quad cane use	4 (1.9)	1 (0.4)	5.65 (0.63–50.9)	.1228	2.98 (0.25–34.8)	.3846
Other walking aid use	2 (1.0)	5 (1.7)	0.55 (0.11–2.87)	.4795	0.13 (0.02–1.07)	.0583
Fall prior year	69 (33.2)	85 (29.4)	1.19 (0.81–1.75)	.3713	1.08 (0.67–1.73)	.7591
Multiple falls	25 (12.0)	32 (11.1)	1.10 (0.63–1.91)	.7440	0.94 (0.48–1.87)	.8683
Injurious falls	41 (19.7)	40 (13.8)	1.53 (0.95–2.46)	.0817	1.74 (0.99–3.07)	.0561
Hospitalization due to a fall	24 (11.5)	31 (10.7)	1.09 (0.62–1.91)	.7760	1.13 (0.57–2.24)	.7299
Poor/fair mobility	78 (37.5)	68 (23.5)	1.97 (1.33–2.91)	.0007	1.70 (1.05–2.75)	.0298
Poor/fair balance	95 (45.7)	105 (36.3)	1.50 (1.04–2.16)	.0291	1.75 (1.12–2.73)	.0145
Frequent dizziness	16 (7.7)	11 (3.8)	2.11 (0.96–4.64)	.0644	2.29 (0.89–5.92)	.0877
Health status/behaviors						
Poor/fair health	76 (36.5)	36 (12.5)	4.08 (2.60–6.39)	<.0001	2.66 (1.54–4.57)	.0004
Smoking	114 (54.8)	124 (42.9)	1.61 (1.13–2.31)	.0090	1.70 (1.08–2.69)	.0222
Cigarettes	113 (54.3)	116 (40.1)	1.77 (1.24–2.54)	.0018	1.73 (1.10–2.72)	.0182
Chewing tobacco	3 (1.4)	0 (0.0)	-----	-----	-----	-----
Pipe smoking	1 (0.5)	7 (2.4)	0.20 (0.02–1.59)	.1272	0.80 (0.08–7.94)	.8464
Cigars	2 (1.0)	7 (2.4)	0.39 (0.08–1.90)	.2448	1.34 (0.18–9.82)	.7726
Current smoking	29 (13.9)	3 (1.0)	15.4 (4.64–51.4)	<.0001	5.32 (1.40–20.2)	.0143
Power of attorney	93 (44.7)	231 (79.9)	0.20 (0.13–0.29)	<.0001	0.33 (0.20–0.53)	<.0001
Morbidity						
Diabetes	75 (36.1)	54 (18.7)	2.45 (1.63–3.70)	<.0001	1.68 (1.01–2.77)	.0443
Arthritis	156 (75.0)	199 (68.9)	1.36 (0.91–2.03)	.1355	1.43 (0.87–2.35)	.1643
Vision problems	140 (67.3)	203 (70.2)	0.87 (0.59–1.28)	.4854	1.00 (0.62–1.60)	.9979
Hypertension	148 (71.2)	171 (59.2)	1.70 (1.16–2.49)	.0062	1.50 (0.94–2.38)	.0868
Osteoporosis	78 (37.5)	143 (49.5)	0.61 (0.43–0.88)	.0082	0.68 (0.43–1.07)	.0953
Anxiety	68 (32.7)	59 (20.4)	1.89 (1.26–2.85)	.0021	1.13 (0.68–1.88)	.6291
Stroke	31 (14.9)	35 (12.1)	1.27 (0.76–2.14)	.3661	1.59 (0.85–2.99)	.1500
Hearing problems	69 (33.2)	135 (46.7)	0.57 (0.39–0.82)	.0026	1.03 (0.65–1.62)	.9106
Depression	69 (33.2)	51 (17.7)	2.32 (1.53–3.52)	<.0001	1.22 (0.73–2.05)	.4540
Congestive heart failure	20 (9.6)	19 (6.6)	1.51 (0.79–2.91)	.2160	1.90 (0.85–4.25)	.1155
Inner ear problems	31 (14.9)	17 (5.9)	2.80 (1.51, 5.22)	.0011	2.45 (1.17–5.14)	.0175
Memory problems	74 (35.6)	98 (33.9)	1.08 (0.74–1.56)	.7000	1.27 (0.81–2.01)	.3020
COPD	58 (27.9)	48 (16.6)	1.94 (1.26–2.99)	.0027	1.64 (0.97–2.78)	.0671
Parkinson's disease	4 (1.9)	6 (2.1)	0.93 (0.26–3.32)	.9046	1.50 (0.33–6.77)	.5945

(continued)

Table 3. (Continued)

|	Subsidized age-based housing (N = 208), n (%)	Unsubsidized age-based housing (N = 289), n (%)	Unadjusted		Adjusted	
			Odds Ratio (95% CI)	p- Value	Odds Ratio (95% CI)	p- Value
Incontinence	53 (25.5)	79 (27.3)	0.91 (0.61–1.36)	.6442	0.86 (0.53–1.41)	.5605
Heart attack	56 (26.9)	67 (23.2)	1.22 (0.81–1.84)	.3409	1.82 (1.08–3.07)	.0238
Peripheral neuropathy	54 (26.0)	47 (16.3)	1.81 (1.16–2.80)	.0085	1.74 (1.02–2.96)	.0428
Sleep problems	93 (44.7)	90 (31.1)	1.79 (1.24–2.59)	.0021	1.47 (0.94–2.30)	.0939
Fractures	53 (25.5)	90 (31.1)	0.76 (0.51–1.13)	.1696	0.73 (0.45–1.18)	.2016
Hip fractures	10 (4.8)	12 (4.2)	1.17 (0.49–2.75)	.7262	2.38 (0.89–6.34)	.0835
Ankle fractures	9 (4.3)	9 (3.1)	1.41 (0.55–3.61)	.4771	0.73 (0.21–2.49)	.6128
Arm fractures	5 (2.4)	11 (3.8)	0.62 (0.21–1.82)	.3863	0.68 (0.20–2.30)	.5381
Leg fractures	4 (1.9)	7 (2.4)	0.79 (0.23–2.73)	.7097	0.51 (0.12–2.22)	.3670
Vertebral fractures	7 (3.4)	4 (1.4)	2.48 (0.72–8.59)	.1514	1.88 (0.44–7.98)	.3933
Wrist fractures	10 (4.8)	17 (5.9)	0.81 (0.36–1.80)	.6027	0.68 (0.27–1.74)	.4245
Other fractures	21 (10.1)	49 (17.0)	0.55 (0.32–0.95)	.0318	0.44 (0.23–0.85)	.0140
Cancer	48 (23.1)	114 (39.5)	0.46 (0.31–0.69)	.0001	0.60 (0.37–0.97)	.0383

of cancer (23.1% vs. 39.5%, OR 0.46 [0.31–0.69]; p=.0001). Subsidized age-based housing residents also reported a higher prevalence of fair-poor health (36.5% vs. 12.5%, OR 4.08 [2.60–6.39]; $p < .0001$) and frequent pain (28.4% vs. 12.8%, OR 2.70 [1.71–4.26]; $p < .0001$).

Health behaviors also differed between the two groups. Subsidized age-based housing residents reported a significantly higher prevalence of ever smoking (54.8% vs. 42.9%, OR 1.61 [1.13–2.31]; p=.0090) and were less likely to report having executed a power of attorney (44.7% vs. 79.9%, OR 0.20 [0.13–0.29]; $p < .0001$).

The unadjusted mortality rate was 62% lower among (Senior Towers) subsidized age-based housing participants (hazard ratio or HR 0.38 [0.22–0.67]; p=.0007; Figure 1) in keeping with the almost 10-year age difference between subsidized age-based housing participants (Senior Towers) and non-subsidized age-based housing (Independent Living) participants (Table 1). Briefly, of the 76 deaths (16 in subsidized; 60 unsubsidized), 34 happened in 2017 to 2019 (8 in subsidized; 26 unsubsidized) pre-pandemic; 12 in 2020 (10 in subsidized, 2 unsubsidized) during the year of flux; and 30 in 2021 to 2022 (6 subsidized, 24 unsubsidized) post-pandemic. So, the differences appear to persist across time.

Adjusted Differences Between Housing Types

Many of the differences between the housing types persisted after adjusting for age, gender, and race (Table 3). Subsidized Age-based housing -restricted housing participants were more likely to report frequent pain (adjusted OR or AOR 2.33 [1.34–4.04]; p=.0026), poor/fair mobility (AOR 1.70 [1.05–2.75]; p=.0298), poor/fair health (AOR 2.66 [1.54–4.57]; p=.0004), cancer
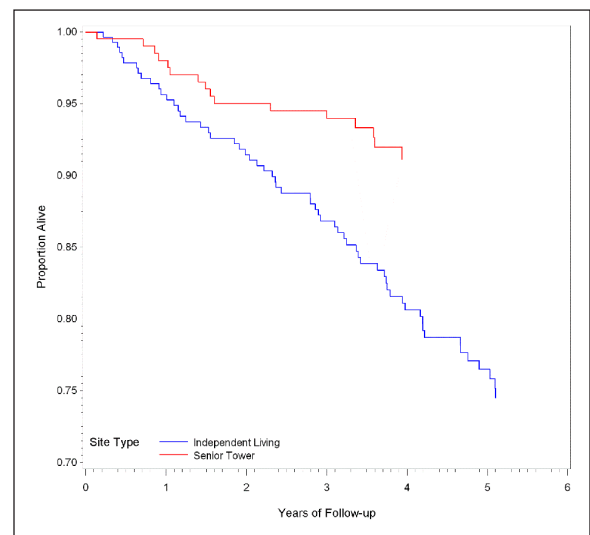
Figure 1. Mortality.

(AOR 0.60 [0.37–0.97]; p=.0383), and having executed a power of attorney (AOR 0.33 [0.20–0.53]; $p < .0001$). Differences in mortality were no longer significant after covariate adjustment (adjusted hazard ratio 1.03; 0.55–1.93).

Discussion

Subsidized age-based housing serves a more diverse population than non-subsidized age-based housing communities. Subsidized age-based housing residents are mainly comprised of lower-income, historically underrepresented populations. They have significantly more long-term illnesses but are less likely to have access to services that might reduce the burden of their illnesses.

Lack of reliable transportation to medical care and groceries may be a significant barrier for many individuals living in subsidized age-based housing. Though some communities' social services coordinators help facilitate occasional trips (once or twice a month), lack of access to transportation is notable (Mwaka et al., 2023; Age Friendly Pittsburgh Progress Report, 2020).

A major finding from the [Anonymized] Registry is the pronounced health disparities between the two populations living in different housing types. This illustrates the noteworthy difference in outcomes associated with socioeconomic variation across the lifespan. Despite being nearly 9 years older, participants from, non-subsidized age-based housing reported substantially less morbidity, disability, and symptoms of poor health and were better prepared for health decline, as indicated by greater use of power of attorney planning than participants from subsidized age-based housing. The greater prevalence of cancer over the lifetime in individuals living in non-subsidized age-based housing may be due to greater use of screening and medical care over the lifetime.

Unlike the spikes in mortality in Assisted Living and Skilled Nursing Facilities during the COVID epidemic (Barnett et al., 2020; Thomas et al., 2021), we did not observe a significant increase in mortality in either subsidized or unsubsidized independent age-based housing.

Lower income can translate to limited choices in educational opportunities, food, transportation, range of employment, and housing. While social safety nets are in place to buffer those with the greatest needs (such as Section 202 housing), the services available still need to be expanded beyond those of wealthier counterparts. People with lower income can be forced to live in less desirable housing that is less structurally sound and at greater risk for environmental health exposures (Kantz et al., 2023; Anonymized for Review #2, 2018). As such, CI theory is supported as an explanatory model for the observed health disparities noted in this study.

Comparing the participants from the two settings, we find that residents of subsidized age-based housing are more diverse, with a larger proportion of lower-income, historically underrepresented populations. Subsidized age-based housing residents are significantly more likely to have long-term illness and are less likely to have access to services to support aging in place. The contrast between the two settings shows the wide range of outcomes typical of aging in the United States and the effect of cumulative disadvantage over the lifespan.

Strengths

The strengths of the study include (1) it provides measurable definitions for congregant housing options for older adults for research purposes, distinguishing between lower-income subsidized age-based housing and the more resource-rich non-subsidized age-based housing congregate living options; (2) it demonstrates that these different settings serve equally different populations based on age, race, and morbidity (but not mortality). Comparing residents in the two types of housing offers important information on variations in health and aging in residents receiving minimal long-term care services who do not qualify for nursing home levels of care. It points to excess morbidity in older adults with lower incomes, which is unfortunately exacerbated by the limited services available at subsidized age-based housing sites. In keeping with HUD's mission to "create strong, sustainable, inclusive communities" (HUD, 2023), providing services in this setting would be reasonable. The poorer health of the population likely reflects lifelong disparities and cumulative disadvantages requiring interventions earlier in the life course; this issue requires further investigation.

Limitations

Limitations of our findings include its single geographic locale; results may not be generalizable beyond the greater Pittsburgh, PA area as services linked to housing may differ in other locations. However, Miller et al. used NIC-Map data to explore service provision characteristics in different levels of age-based housing at the national level; Both Miller et al. and our study can be limited by the fact that CCRC's require special licensure, which are easily tracked; however, stand-alone age-based Independent Living communities cannot be tracked in the same ways. This national level data did not look at resident level data. This provides room for further investigation on the differences between different age-based independent living types.

The registry used in this research is also limited to self-report with minimal information in specific domains, such as functional status. An essential and notable limitation is that educational level was not included in the [Anonymized] Registry intake questionnaire. This limitation is being addressed for future participants in the registry so that we have a more reliable proxy for socioeconomic status. The questionnaire is also being updated to include more detailed functional measures so that better characterizations and comparisons between populations can be made when referring participants to research studies. As the sample only includes people willing to join a research registry, these findings may be subject to selection bias.

Despite the limitations, comparing residents in the two types of housing offers insightful information on variation in health and aging among residents receiving minimal long-term care services and who do not qualify for higher levels of care. It points to excess morbidity in older adults with lower incomes, which is unfortunately exacerbated by the limited services available at subsidized age-based housing sites. In keeping with HUD's mission to make the home a place for health (HUD,

2023), it would be reasonable to provide services in this setting. However, the poorer health of this population likely reflects lifelong disparities and cumulative disadvantages requiring interventions earlier in the life course.

Conclusions and Applications of Study Findings

Subsidized age-based housing and non-subsidized age-based housing communities serve distinctly different populations. Generally, independent subsidized housing includes low-income, age-based housing units subsidized by the U.S. Department of Housing and Urban Development (HUD). They may provide limited enhanced services to older adults and accessible bathrooms in individual apartments. Conversely, non-subsidized age-based housing offers more age-friendly residential services (including expanded transportation options to obtain groceries and medical care) to residents but are often expensive than their subsidized counterparts.

Non-subsidized age-based housing residents were nearly a decade older than the subsidized age-based housing residents. However, they did not face an elevated mortality risk over up to 5 years of follow up. Despite more significant disease burden and health needs than their non-subsidized age-based housing counterparts, they usually receive fewer aging support services.

Standardized definitions for different types of Independent Living options (subsidized and non-subsidized) can be used to drive research on housing and services for older at the national level. Distinguishing between subsidized and non-subsidized Independent Living in research is necessary because they potentially serve different populations and offer different levels of aging support services.

Different types of housing with differing financial supports attract different kinds of people have an effect on their morbidity risks. There is a need for research to be expanded to the national level to consider how to provide better age-friendly services in subsidized senior living.

ORCID iDs

Janelle J. Christensen https://orcid.org/0000-0001-5549-3779
Jennifer S. Brach https://orcid.org/0000-0002-7793-2004

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