

Factors Predicting Loneliness in Older Adults Attending Delaware Senior Center Programs

Serena A. Schade, MS;¹ Julia O'Hanlon, MPA;² Adam Davey, PhD;¹ Elizabeth Orsega-Smith, PhD¹

1. Health Behavior and Nutrition Sciences, University of Delaware

2. The Biden School of Public Policy and Administration, University of Delaware

Abstract

Loneliness, a risk factor for chronic diseases, is experienced by one-third of older adults.

Objective. This study aimed to explore the factors predicting loneliness among older adults attending Delaware senior center programs. **Methods.** Participants attending Delaware senior centers completed pre-and post-program surveys, including loneliness (UCLA Loneliness Scale), self-rated physical and mental health (SF-12), and demographic items. This study was conducted using data from a state-wide evaluation project of 16 senior centers during the summer of 2024. **Results.** Participants included 234 older adults (median age = 74.0±8.3 years; 205 female, 27 male). Nearly a third of participants visited the senior center 3 - 4 times in the past week (32.9%) or 1 - 2 times (33.1%). Approximately half of participants reported living with a spouse or another family member (55.6%) and 38.5% reported living alone. Three-quarters of participants identified as white (73.1%), and participants reported average physical and mental health (PH:47.8±8.4; MH:50.9±5.3) via the SF-12. Senior center attendance, pre-program loneliness scores, self-rated mental health, self-rated physical health ($B=-0.02$, $p=0.047$), and identifying as white were significant predictors of post-program loneliness in older adults attending senior centers. Estimated marginal effects suggested that more frequent attendance may be associated with lower loneliness amongst individuals with higher baseline loneliness. **Conclusion.** Our findings suggest that more frequent senior center attendance is associated with lower post-program loneliness and highlight the multifaceted nature of loneliness, including the influence of health and demographic factors. **Policy Implications.** Resources are needed for senior centers to tailor programs to provide opportunities for social engagement and to increase outreach to older adults at risk for loneliness, as senior centers provide important infrastructure to support healthy aging and mitigate loneliness.

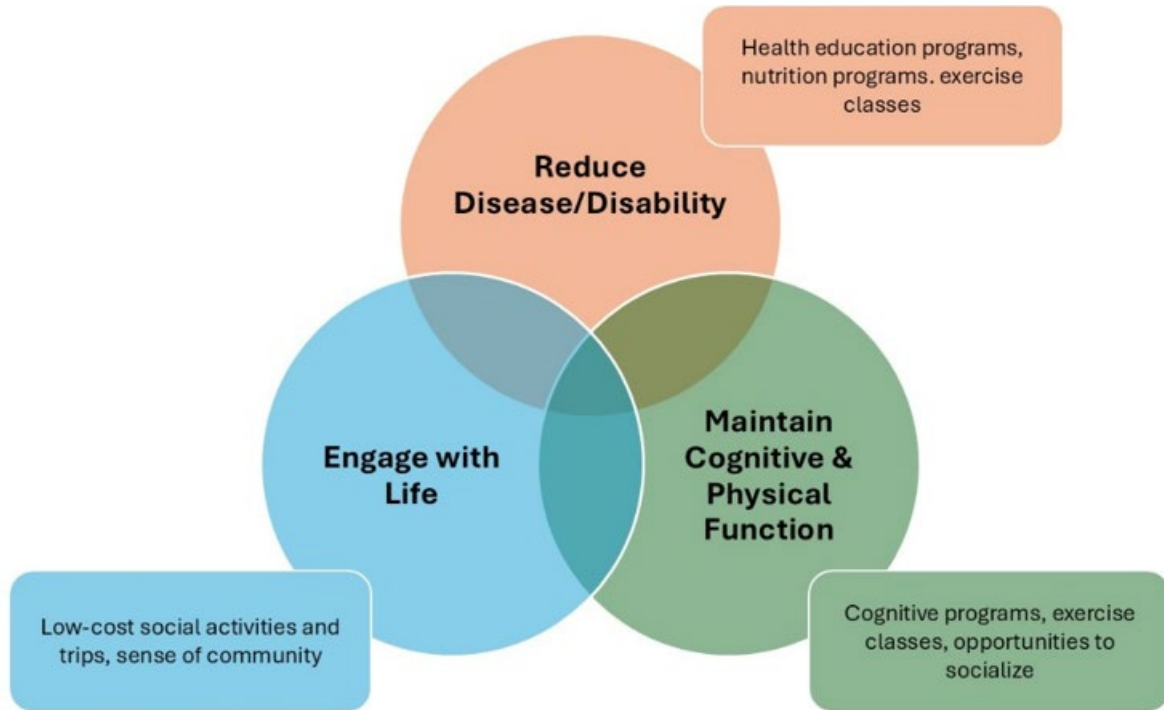
Introduction

Approximately 33% of older adults in the U.S. report feelings of loneliness and 29% feel socially isolated.¹ Loneliness is a risk factor for cardiovascular diseases, dementia, type 2 diabetes, and depression.²⁻⁶ Being widowed or unmarried, low participation in social activities, poor perceived health, and the experience of depressive symptoms are risk-factors for experiencing loneliness as one ages.⁷ Conversely, social support has been linked to greater satisfaction with life and reduced risk of depression.⁸ Furthermore, those with higher levels of social support have been found to have decreased risk of all-cause mortality and cardiovascular diseases in comparison to those with low levels of social support.^{4,9} Thus, loneliness and social isolation amongst older adults is a public health concern that needs attention.

One potential solution to alleviating social isolation and loneliness in older adults is to provide social engaging community programs, such as those offered at senior centers. Senior centers are often located within local communities, making them easy to reach for older adults who may have limited transportation options. These community hubs for older adults offer a variety of low cost, accessible programs such as exercise classes, health education, meal programs, trips, games, and crafts, among others.¹⁰ By increasing accessibility and offering low-cost programs, senior centers help reduce barriers to participating in health-promoting activities.¹¹ Senior centers allow older adults to make new friends and build supportive relationships through their programs as exemplified in one study, where participants stated that their friends from the senior center support them through life's challenges and that these friendships extend beyond the center.¹³ There are more than 11,000 senior centers across the US.¹³ Specifically in Delaware, there are 37 senior centers serving the approximately 231,070 older adults that reside in the state.^{14,15}

The role of senior centers extends beyond reducing social isolation and providing access to health-promoting activities. Senior centers are important public infrastructure to support successful aging amongst older adults. Senior centers have the potential to contribute to successful aging in their members. Rowe and Kahn's Successful Aging Model provides a theoretical framework for the present study, wherein dimensions of healthy aging include reducing disease and disability, engaging with life, and maintaining high cognitive and physical functioning (Figure 1).¹⁶ Rowe and Kahn present the life-course perspective which posits that successful aging is influenced at the institutional level and is a societal-level objective.¹⁶ By offering programs that support each dimension of successful aging (e.g., exercise classes and health education programs aid in reducing disease and disability; trips, building a sense of community, and other social programs support engagement with life; and cognitive programs and exercise classes support the maintenance of mental and physical function) senior centers are an integral community setting to improve the quality of life in older adults.¹⁶ Senior centers provide institutional support for healthy aging not only through their program offerings, but also by reducing barriers to healthy aging, such as social isolation, lack of transportation, and by minimizing fees for their members.

Figure 1. The Role of Senior Centers in Rowe and Kahn's Successful Aging Model



In 2024, the Delaware's Division of Services for Aging and Adults with Disability (DSAAPD) provided small grants to 16 senior centers across the State of Delaware to support healthy aging programs. Funded programs varied by site and were specific to the needs and preferences of each center and included art programs (e.g., painting, jewelry making), exercise classes (e.g., Bingocize, line dancing), nutrition education, and language learning programs (Spanish classes). The present study is a secondary analysis of matched pre-and post-program data from the evaluation of DSAAPD mini grant funded programs.

This exploratory study aimed to answer the following research question: what factors predict loneliness in older adults attending senior center programs? We hypothesized that pre-program loneliness, whether one lives alone or not, the number of days they attend the senior center, race/ethnicity, and self-rated mental and physical health will be significant predictors of post-program loneliness.

Methods

Participants

Participants included individuals at least 50 years of age who were already enrolled in classes at participating senior centers. There were no exclusion criteria. The minimum age of 50 was selected as senior center membership was open to those 50 years and older in most of the centers participating in this study. Senior center sites included those who were DSAAPD small grant recipients. The study was conducted as a single group, quasi-experimental design with pre-and post-program assessments and surveys were administered by each center's program administrators in 2024. Program duration and length of time between pre- and post-testing varied

between 1-5 months, depending on each senior centers' program implementation. The study protocol was approved by the University of Delaware's Institutional Review Board (IRB #: 2157640-1). The study protocol and reporting of results is consistent with the TREND statement checklist for reporting non-randomized behavioral evaluations.¹⁷

Measures

The pre-program questionnaire consisted of the UCLA Loneliness Scale,¹⁸ the Medical Outcomes Survey (SF-12),¹⁹ demographic items,²¹ and an item assessing the senior center attendance. The post-program questionnaire included the same measures as the pre-program questionnaire, except demographic items.

The UCLA Loneliness Scale is a three-item measure wherein scores range from 3 – 9, with higher scores indicating higher levels of loneliness and those with scores ≥ 6 are considered to be lonely.¹⁸ Questions include: “How often do you feel that you lack companionship?”, “How often do you feel left out?”, and “How often do you feel isolated from others?”.¹⁸ The UCLA loneliness scale is valid (correlation coefficient = 0.91) and reliable (Cronbach's $\alpha = 0.72$) for use in the older adult population.¹⁸

Self-rated mental and physical health was measured using the Medical Outcomes Survey SF-12 which is a 12-item scale assessing how daily activities are impacted by global self-rated health over the past 4 weeks and the frequency to which individuals have experienced positive or negative emotions (e.g., feeling calm, feeling energetic). Scores range from 0 – 100, where higher scores indicate greater self-rated health.¹⁹ The SF-12 is validated for use with older adults, with a Cronbach's $\alpha = 0.86$ indicating a high level of reliability and intraclass correlation coefficient of 0.59 indicating moderate program-reprogram validity.²⁰

Demographic items included age, sex, living status (e.g., alone, with spouse in own home, with other family members in own home, with others in own home), and race/ethnicity. Race/ethnicity was self-reported by participants by selecting one of the following options: Hispanic, White alone, non-Hispanic, Black or African American alone, non-Hispanic, American Indian and Alaska Native alone, non-Hispanic, Asian alone, non-Hispanic, Native Hawaiian and Other Pacific Islander alone, non-Hispanic, Some other race alone, non-Hispanic. Multiracial, non-Hispanic.²¹

Senior center attendance was assessed with an item asking participants, “Over the past 7 DAYS, how many times did you visit the senior center?”, with four possible responses (e.g., attended 0 times, 1 - 2 times, 3 - 4 times, 5 or more times).

Statistical Analysis

Participants who provided matched pre-and post-program data (N = 234) were included in the analyses. Analysis was conducted using Stata (StataCorp. 2025. Stata Statistical Software: Release 19. College Station, TX: StataCorp LLC.). Race/ethnicity and living situation were dichotomized as white and non-white and living alone vs. living with others, respectively due to sample size considerations. Descriptive statistics were calculated and normality was assessed via Shapiro-Wilk tests. Post-program loneliness scores were regressed on pre-program loneliness, number of post-program senior center visits, and also adjusted for pre-program mental health and physical health, race/ethnicity, and living situation. Hypothesis testing relied

on robust bootstrapped standard errors with 1000 replication samples and used $\alpha=0.10$ due to the exploratory nature of our dose-response hypothesis. Estimated marginal effects were then calculated and plotted to explore the interaction between post-program loneliness and the number of senior center visits.

Results

Participants ($N = 234$; age = 74.0 ± 8.3 yrs; 205F/27M; Table 1) varied in their senior center attendance in the past week, wherein many attend their senior center 1-2 times per week ($n = 88$; 33.1%) or 3-4 times ($n = 76$; 32.9%). Twenty-eight participants attended 5 or more times (12.1%), and 39 participants (16.9%) attended zero times in the past week. With respect to living situation, the majority of participants reported either living with a spouse/partner in their own home ($n = 98$; 42.6%) or living alone in their own home ($n = 90$; 39.1%) and 42 participants reported living with family members or other people in their own home (18.3%). Participants reported average physical (47.8 ± 8.4) and mental health (50.9 ± 5.3) via the SF-12. Loneliness scores at both pre-and post-testing indicated low levels of loneliness (pre: 3.86 ± 1.3 v. post: 3.89 ± 1.3) via the UCLA Loneliness Scale, 35 (15.3%) participants reported significant feelings of loneliness, with scores ≥ 6 .¹⁸

Table 1. Participant Demographics

Variable	n (%)
Sex	
Female	205 (86.9%)
Male	27 (11.4%)
Race/Ethnicity	
White	171 (72.46%)
Black/African American	53 (22.46%)
Hispanic	3 (1.27%)
Asian	3 (1.27%)
Native American/Alaskan Native	1 (0.42%)
Mixed-Race	2 (0.85%)
Living Situation	
Living Alone	90 (38.14%)
Living with Spouse/Partner	98 (41.53%)
Living with Other Family Members	35 (14.83%)
Living with Others in Own Home	7 (2.97%)
Variable	Mean $\pm$ Std. (range)
Age (yrs.)	74.0 ± 8.3 (51-95)
Pre-Program Self-Rated Mental Health	50.9 ± 5.3 (22.2–60.4)
Pre-Program Self-Rated Physical Health	47.8 ± 8.4 (15.7–60.0)

Pre-program loneliness	3.86 ± 1.3 (3-9)
Post-program loneliness	3.89 ± 1.3 (3-9)

A multiple linear regression model examined predictors of post-program loneliness, adjusting for pre-program loneliness, post-program visits, physical health, mental health, race/ethnicity, and living situation (Table 2). The overall model was statistically significant, $F(6, 205) = 12.91$, $p < 0.001$, explaining 36.3% of the variance in post-program loneliness scores (adjusted $R^2 = 0.3625$).

Higher pre-program loneliness scores were significantly associated with higher post-program loneliness scores ($B = 0.43$, $p < 0.001$). Greater self-rated mental health ($B = -0.05$, $p = 0.02$) and physical health ($B = -0.02$, $p = 0.047$) were associated with lower post-program loneliness scores. White participants reported higher post-program loneliness compared to non-white participants ($B = 0.28$, $p = 0.05$). Participants' living situation was not significantly associated with post-program loneliness ($p = 0.52$).

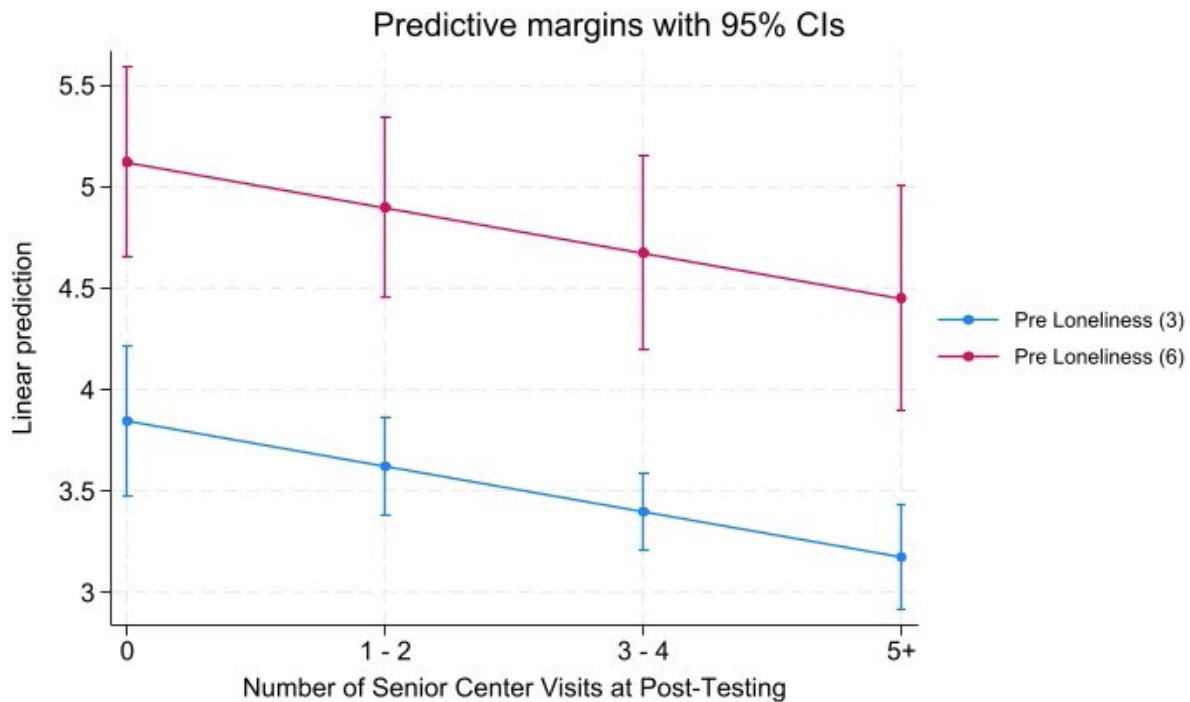
Estimated marginal effects (Figure 2) depicted that the association between senior center attendance and predicted post-program loneliness differed by baseline loneliness. Those with low pre-program loneliness (score = 3), predicted post-program loneliness decreased from 3.85 amongst those who reported 0 senior center visits to 3.18 in those who visited 5 or more times in a week. Those with high baseline loneliness (score = 6), predicted loneliness decreased from 5.12 to 4.45.

Table 2. Regression Results

	Coefficient	SE	z	p	95% CI
Intercept	6.3	1.7	3.69	<0.001***	[2.94, 9.64]
Pre loneliness	0.43	0.1	4.35	<0.001***	[0.23, 0.62]
Post-Visits	-0.22	0.08	-2.64	0.008**	[-0.39, -0.06]
White	0.28	0.15	1.94	0.05*	[-0.003, 0.57]
Living Alone	0.1	0.16	0.64	0.52	[-0.21, 0.42]
Mental Health	-0.05	0.02	-2.28	0.02**	[-0.09, -0.007]
Physical Health	-0.02	0.01	-1.99	0.047**	[-0.05, -0.0003]

Multiple linear regression with bootstrapping ($n = 212$; 1000 replications); dependent variable: post-program loneliness; * <0.1 ** <0.05 *** <0.001

Figure 2. Predicting Post-Program Loneliness by Pre-Program Loneliness and Number of Senior Center Visits



Discussion

The present study aimed to answer the following research question: what factors predict loneliness in older adults attending senior center programs? Aligning with our hypothesis, post-program loneliness amongst senior center attendees was predicted by the weekly frequency of senior center attendance, pre-program loneliness scores, self-rated mental health, self-rated physical health, and race/ethnicity. Senior center attendance was a significant predictor of post-program loneliness and marginal estimates suggest that more frequent senior center attendance may be associated with greater reductions in loneliness amongst those with higher baseline loneliness. Although senior center attendance largely varied in our participants, two-thirds visited the senior center either 3 - 4 times (32.9%) or 1 - 2 times in the past week (33.1%). Our findings support those from previous literature, in which senior center attendance was associated with significantly lower loneliness, however our results differ regarding the dose-response relationship.²² Xie and colleagues found that attending the senior center at least 4 days per week was associated with significantly lower loneliness compared to those who attended less than once per week, but attending 2 - 3 days per week was not associated with loneliness.²² Our findings contribute to the limited literature regarding senior center participation and loneliness in older adults, emphasizing a need for future research to explore this potential dose-response relationship further.

Our findings that lower mental health scores are a predictor of higher post-program loneliness supports previous literature associating loneliness and depressive symptoms or mental distress in older adults.^{23,24} Ward and colleagues discussed the bi-directional relationship between loneliness and depression in older adults, such that experiencing loneliness may exacerbate symptoms of

depression and depression symptoms may lead to socially isolating oneself or feeling lonely.²⁵ Regarding physical health our findings align with previous literature in which lower physical function and greater difficulty with activities of daily living were associated with higher levels of loneliness.^{26,27} Our finding that individuals who identified as white were more likely to experience higher loneliness scores contrasts previous literature, in which those belonging to ethnic minorities experienced greater levels of loneliness, mediated by socioeconomic disparities (e.g., income, education, cultural acclimation).^{28–30} Future research should further explore potential cultural and socioeconomic factors (e.g., income, family norms, education level, intergenerational relationships) contributing to loneliness amongst older adults.^{28–30} Lastly, contrary to our hypothesis, whether one lived alone was not a significant predictor of loneliness. Although living alone may impact loneliness in older adults,² several studies have also found living situation to be unrelated to loneliness or social isolation.^{31,32}

Senior center programs offer opportunities for improving physical and mental health as well as to engage with life, which are pillars of successful aging as described by Rowe and Kahn.¹⁶ Consistent with this framework, greater senior center attendance was associated with lower loneliness and both mental and physical health were significant predictors of loneliness.¹⁶ Together, these findings highlight the potential role of senior centers in promoting healthy aging through supporting social connection and health promoting activities.

This study has several important limitations. First, the sample consisted exclusively of older adults who attended senior center programs in a single U.S. state and was derived from a statewide program evaluation. As a result, the findings may not be generalizable to older adults who do not participate in senior center activities, including those who may be more socially isolated or at greater risk for loneliness. Consistent with this, participants in the present study reported low levels of loneliness on average, suggesting that the sample may represent a more socially engaged segment of the older adult population. Additionally, as this study was cross-sectional, we examined senior center attendance in a one-week timespan, which may not be reflective of participants' normal attendance or attendance at other times of the year (e.g., during the winter or holidays). Our findings demonstrate real-world applicability as the population represents those who attend the senior center and they attended program(s) of their choice, although this limits casual claims as class type and participation level were not controlled for. Furthermore, additional psychosocial factors (e.g., income, education level, marital status, chronic diseases) were not available for the present study and could add meaningful insight to future research. Future research and health promotion programs should explore how to reach individuals who are at risk for or experiencing social isolation, as they may not be attending senior center programs. Senior centers act as public infrastructure to improve older adults' quality of life and contribute to successful aging, therefore research in this setting should be explored further.

Public Health Implications

The prevalence of loneliness amongst older adults is a public health concern, with 31.6% of community-dwelling older adults reporting significant feelings of loneliness and 55% of those residing in assisted living communities.^{34,35} As the older adult population continues to grow, addressing loneliness is an increasingly important public health priority since numerous studies have linked feelings of loneliness with higher risk of chronic health conditions (e.g.,

cardiovascular disease, depression) and dementia.^{3–6,8} Overall, our findings emphasize that older adults' experience of loneliness is multifaceted, including potential biological (physical and mental health) and cultural influences (race/ethnicity). Health promotion programs should include targeted outreach to those who are experiencing or at risk of loneliness to improve social connection and ultimately reduce the risk of chronic mental and physical health conditions.^{3,33} The present study provides evidence of health-related and demographic factors that impact loneliness in older adults and suggests that senior centers may play a role in mitigating loneliness, particularly among individuals at greater risk. These findings can inform community programming, resource allocation, and policies aimed at promoting social connectedness, well-being, and independence among older adults.

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Ms. Schade may be contacted at sschade@udel.edu.

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