Original Article

Associations between Socioeconomic Status and Social Isolation across Age Groups: A Cross-sectional Study in Singapore

Lixia Ge [1]

[1] Health Services and Outcomes Research, National Healthcare Group, Singapore

*Corresponding author:
 Lixia Ge
 E-mail: lixia_ge@nhg.com.sg
 Telephone: +65 6038 3697
 ORCID: 0000-0001-8080-7020

Abstract

Background: The impact of socioeconomic status on social isolation is well-established, yet understanding how this relationship varies across different age groups remains underexplored. This study addresses this gap by investigating the association between various socioeconomic indicators and social isolation across three distinct age categories: young adults (21-44 years), middle-aged adults (45-64 years), and older adults (≥65 years).

Methods: The 6-item Lubben Social Network Scale was used to assess social isolation. Socioeconomic status was measured through education level, employment status, personal income, housing type, and self-perceived money sufficiency. Logistic regressions were employed to examine the association between socioeconomic indicators and social isolation within each age group.

Results: Results revealed a consistent gradient in the relationship between socioeconomic status and social isolation, with notable age-related disparities. Specifically, income and self-perceived financial sufficiency emerged as significant indicators associated with social isolation among young adults, whereas middle-aged adults exhibited associations with education, employment status, income, housing type, and self-perceived financial sufficiency. For older adults, housing type and self-perceived financial sufficiency were key factors influencing social isolation, even after controlling for demographic variables and other socioeconomic indicators.

Conclusion: This study underscores the nuanced impact of individual socioeconomic indicators on social isolation across different age groups. By delineating these associations, it offers insights into the selection of appropriate socioeconomic measures and underscores the necessity for tailored interventions targeting specific socioeconomic groups within each age cohort.

Keywords: Socioeconomic Status, Social Isolation, Singapore, Age Disparity

Introduction

Social isolation, characterized by a lack of both the quantity and quality of social relationships and interactions that offer positive reinforcement (Durcan & Bell, 2015), is a prevalent and significant concern not only among older adults but also across various life stages (Child & Lawton, 2019; Primack et al., 2017). Recent evidence has suggested that people around the world are more socially isolated now than ever before (J. Lubben et al., 2015). In Singapore, factors such as population ageing and the shift towards nuclear families have exacerbated the likelihood of social isolation (Wee et al., 2019). Recognized as a pressing global issue, social isolation exerts a substantial and escalating influence on health across the lifespan, including but not limit to physical and psychological health, morbidity (Bhatti & Haq, 2017), and mortality (Laugesen et al., 2018). A meta-analytic review has equated that the impact of social isolation on mortality with well-established risk factors such as cigarette smoking and alcohol consumption (Holt-Lunstad et al., 2010), underscoring its profound implications. In addition, being socially isolated also results in higher spending on health and social care services (Saito et al., 2019).

Socioeconomic status (SES) serves as a comprehensive descriptor of an individual's combined economic and social standing, reflecting one's access to collectively desired resources such as material wealth, financial stability, social networks, healthcare, leisure opportunities, and educational attainment (Oakes & Rossi, 2003). Notably, research has suggested that many risk factors for social isolation are disproportionately distributed across society and are more prevalent among economically or socially disadvantaged populations (Durcan & Bell, 2015; Gouda & Okamoto, 2012). The Social Determinants of Health Theory (P. Braveman & Gottlieb, 2014), a well-established framework, robustly supports the idea that socioeconomic factors are fundamental determinants of health and well-being. This theory emphasizes that lower SES often leads to reduced access to social resources, which in turn contributes to social isolation and subsequent health disparities. This highlights the undeniable influence of SES on social isolation, whether through direct or indirect pathways. Identifying those at risk for social isolation is a crucial first step in addressing isolation as a public health concern (Klinenberg, 2016). Commonly used proxy indicators of SES, such as education, employment status or occupational class, and income (Doshi et al., 2016), offer valuable insights into the socioeconomic predictors or impacts of social isolation.
The highest level of education is typically attained and established during early adulthood and consistently demonstrates a positive association with many health outcomes across all ages. However, prior research has yielded inconsistent findings regarding the association between the highest level of education and social isolation. While some studies have suggested that more educated individuals tend to have larger confidant networks than their less well-educated counterparts (Cudjoe et al., 2018; McPherson et al., 2006), another study has found that individuals with lower levels of education exhibit a lower likelihood of experiencing social isolation in mid and later life stages (Menec et al., 2019).

Unemployment, recognized as a stressful life event, can profoundly impact various aspects of health, including social isolation (Norström et al., 2014). The ramifications of unemployment on individuals' social life, financial status, physical and psychological health vary across different life stages (Brydsten et al., 2018). A large European study has revealed that unemployed young and middle-aged adults are more susceptible to social isolation compared to their employed counterparts (Dieckhoff & Gash, 2015), whereas another study demonstrated that retired individuals, the unemployed, those who were sick or disabled, and homemakers exhibit poorer social engagement compared to employed older adults (Whitley & Popham, 2017).

Personal or household income serves as an indicator of the availability of economic and material resources. While a limited body of literature has examined the relationship between low income and social isolation, existing studies have highlighted its significance. A mixed-method study has showed that low-income individuals are more prone to experiencing feeling of isolation compared to their counterparts (Stewart et al., 2009). Moreover,

two large-scale population studies has demonstrated that low income is independently associated with social isolation (Cudjoe et al., 2018; Menec et al., 2019).

In addition to the above-mentioned objective measures, indicators of subjective SES have emerged as strong predictors of several aspects of health (Nobles et al., 2013). Despite this, research exploring the association between self-perceived SES and social isolation is scant. A study conducted among elderly residents in Japan has revealed a robust association between low self-perceived SES and isolation (Gouda & Okamoto, 2012). However, the extent to which subjective indicators of SES are associated with social isolation in younger adults, as well as their relative strength compared to objective indicators, remains unclear.

There is growing recognition of the dynamic nature of an individual's SES throughout the life course (P. A. Braveman et al., 2005), with varying SES levels at different life stages potentially exerting diverse influences on health outcomes (Heslop et al., 2001; Smith et al., 1997). Consequently, there is heightened interest in investigating how different SES indicators impact health at different life stages (Malhotra et al., 2013). Similarly, as people age, their social networks may undergo significant changes due to factors such as alternations in living arrangement, migration of family members or friends, shifts in social roles, physical illnesses, declines in physical or cognitive abilities, and loss of social network members (Cudjoe et al., 2018). Additionally, according to the socio-emotional selectivity theory (SST), people's social networks tend to narrow, focusing more on emotionally meaningful relationships and prioritizing quality over quantity in their social interactions as they age (Carstensen et al., 1999). These dynamics suggest that the relationship between specific SES indicators and social isolation may vary across different stages of life.

Despite extensive research on the associations between different indicators of SES and social isolation, notable gaps remain in our understanding of how these associations vary across different stages of life. Previous studies have yielded inconsistent findings, particularly regarding the role of education in social isolation and the influence of employment status on social connectivity. Additionally, the relationship between income and social isolation across various age groups has been underexplored. Moreover, while subjective SES has emerged as a strong predictor of several health outcomes, its association with social isolation, especially in younger adults, remains unclear. This study aims to address these gaps by investigating the differential impacts of various SES indicators on social isolation across different age cohorts. Through this study, we seek to provide a more nuanced understanding of these relationships, which can offer valuable insights into indicator selection for measurement and inform the development of targeted and effective interventions and policies to mitigate social isolation across various population groups.

Methods

Design

This correlational, cross-sectional study aimed to examine the relationship between individual SES indicators, including four objective indicators and a subjective indicator, and social isolation across three distinct age groups: young (21- 44 years), middle-aged (45 - 64 years), and older adults (≥ 65 years).

Data Source and Study Sample

Data were derived from the baseline of a population-based longitudinal health survey conducted among a representative sample of community-dwelling adults in the Central Region of Singapore. The study details have been previously described (Ge et al., 2017, 2018). Briefly, eligible participants included Singapore citizens or permanent residents aged 21 years and above who had lived in the randomly selected housing unit for the past 6 months. Participants were identified via door-to-door visits to these household units. One eligible household

member was randomly selected and underwent detailed structured interviews conducted by trained surveyors. The study was approved by the ethical committee of the National Healthcare Group Domain Specific Review Board (DSRB, Reference Number: 2015/00269). Written informed consent was obtained from individual participants after they were informed about the study's purpose, procedures, potential risks and benefits, and confidentiality of the data collected. A total of 1,942 adults (response rate 53.3%) participated in the survey between November 2015 and January 2017. For the purposes of this study, data of 1,930 participants with valid responses on the social isolation measure was included in the analysis.

Data Measures

Social Isolation

The 6-item Lubben Social Network Scale (LSNS-6), a standardized measure of social isolation, was used to screen for the presence of social isolation (J. Lubben et al., 2006). Participants were asked three questions to ascertain kinship and non-kinship ties, respectively: "How many relatives / friends do you see or hear from at least once a month?", "How many relatives / friends do you feel close to such that you could call on them for help?" and "How many relatives / friends do you feel at ease with that you can talk about private matters?". Response options ranging from 0 to 5 were presented for each question. The total score of the 6-item scale ranged from 0 to 30, with a score of 12 or less indicating social isolation (J. Lubben et al., 2006). The LSNS-6 and its two subscales have demonstrated high levels of reliability (Cronbach's alpha=0.80 - 0.89), stable factor structures, and high correlations with criterion variables (J. E. Lubben et al., 2006). The present study demonstrated its good internal consistency reliability with Cronbach's alpha = 0.82.

Socioeconomic Status

Objective measures of SES. The objective SES of the participants was measured using four indicators: education level, employment status, personal income, and housing type. The level of education was measured based on the highest educational attainment which was categorized into three groups: 1: Low (primary or lower), 2: Middle (lower secondary, secondary, post-secondary), 3: High (polytechnic diploma, professional qualification, bachelor or higher). Employment status was classified into four categories: 1: Unemployed, 2: Inactive (including homemaker, retired, and student / national service), and 3: Employed (including full-time and part-time employed, self-employed). Personal income was determined through self-reported monthly all-source income and grouped into three categories: 1: SGD1,500 or lower, 2: SGD1,051 – 5,000, and 3: SGD5,001 and above (US$1 = SGD1.38). Housing type in Singapore is often used as a measure of SES as it is positively correlated with household income (Malhotra et al., 2013). In this study, housing type was categorized into three categories: 1: public 1- & 2-room flats, 2: public 3- & 4-room flats, and 3: public 5-room flats and above, as well as private properties.

Subjective measure of SES. Individuals' self-perceived money insufficiency (0: No, 1: Yes) based on the question "Do you often run out of money, even with proper spending plan, to buy essential items or pay bills to maintain basic living needs (i.e. accommodation, food, transportation and healthcare)?" was used as a proxy of subjective measure of SES.

Covariates

The following variables were extracted as covariates: age, sex (male or female), ethnicity (Chinese, Malay, Indian, Others), marital status (single, married, divorced/widowed) and living arrangement (living alone / with unrelated individuals, living with spouse with/without child(ren), living with child(ren) but no spouse, and living with parent/friend/other relative).

Data Analysis

Descriptive analyses were conducted for each age group, with weighted mean and standard deviation (SD) reported for continuous variables, and unweighted frequency and weighted percentage reported for categorical variables. The relationship between categorical socio-demographic variables and social isolation in each age group was determined using Chi-squared tests or Fisher's exact tests.

To examine the relationship between each SES indicator and social isolation stratified by the three age groups, logistic regression analyses were performed. Each SES indicator served as the independent variable and social isolation (0=not isolated and 1=isolated) was the dependent variable, adjusting for covariates including age, gender, ethnicity, marital status and living arrangement (Model 1). Results were presented in terms of Average Marginal Effect (AME) multiplied by 100 (AME %). AMEs were computed to ascertain the average change in the probability of experiencing social isolation as SES increased from the reference group while keeping other covariates at their observed values (Torrres-Reyna, 2014).

To examine the independent association of the five SES indicators with social isolation across the three age groups, all the five SES indicators were simultaneously included in the full model, adjusting for age, gender, ethnicity, marital status and living arrangement (Model 2). Individual SES indicators' AMEs were estimated to determine their impact on social isolation.

McKelvey & Zavoina's pseudo-R^2 was employed to compare the estimates of explained variance from different models using the same dataset (DeMaris, 2002). To investigate the contribution of each SES indicator to model fit, the change in pseudo-R^2 was calculated by subtracting the pseudo-R^2 value of the basic model (including only social isolation as the dependent variable and the variables for adjustment) from the pseudo-R^2 value obtained by separately adding each SES indicator to the basic model (Model 1). In addition, for each SES indicator, the absolute change in pseudo-R^2 associated to the exclusion of that indicator from the full model (Model 2) was calculated. All analyses were performed using Stata/SE 16.0 and a significance level of $p<0.05$ was set for statistical significance.

Results

Characteristics of study participants

The weighted mean age of the 1,930 participants was 48.4 years (SD=16.8, range 21 - 97 years). The majority of participants were Chinese (78%), married (63%), living with spouse (60%), and resided in public 3- & 4-room flat (63%). Among the participants, 657 (43%) were aged 21–44 years old, 776 (38%) were aged 45–64 years, and 497 (19%) were aged 65 years and above. A breakdown of participants' profiles by age groups is presented in Table 1.

Association Between SES Indicators and Social Isolation in Individual Age Groups

There were significant differences in the proportion of isolated individuals across the three age groups. Specifically, 14% of young adults, 28% of middle-aged adults, and 45% of older adults were found to be socially isolated.

Table 1
Characteristics of study participants stratified by three age groups

Characteristics	All		Age group (weighted %)		
	n	Weighted %	Young adults (aged 21-44) (n=657)	Middle-aged (aged 45-64) (n=776)	Older adults (aged ≥65) (n=497)
Gender					
Male	852	48.0	48.4	49.6	44.0
Female	1078	52.0	51.6	50.4	56.0
Ethnicity					
Chinese	1514	77.8	73.9	79.0	84.3
Malay	152	8.1	8.2	9.1	5.9
Indian	211	11.5	14.4	10.0	7.9
Others	53	2.6	3.5	2.0	2.0
Marital status					
Married	1169	62.5	48.7	76.6	65.7
Single	454	27.8	49.3	13.4	7.2
Divorce/widowed	307	9.7	2.0	10.0	27.0
Living arrangement					
Spouse w/wo child(ren)	1105	59.5	46.8	73.1	61.6
Child(ren), no spouse	196	8.1	2.8	9.0	18.7
Parent/friend/other relative	344	26.1	47.6	11.3	6.3
Alone/with unrelated persons	285	6.3	2.9	6.5	13.4
Education level					
High	441	27.0	47.4	15.5	5.4
Middle	391	23.7	49.7	61.3	34.1
Low	1098	49.4	2.9	23.2	60.5
Employment status					
Employed	1225	67.1	79.1	76.2	21.0
Inactive	616	28.4	16.6	18.8	75.3
Unemployed	89	4.5	4.3	5.1	3.7
Personal income					
>=SGD5,001	245	13.8	17.7	15.5	1.6
SGD1,501-SGD5,000	692	40.0	53.7	39.3	9.9
<=SGD1,500	993	46.1	28.6	45.2	88.5
Housing types					
Public 5-room&above	490	29.5	29.7	32.1	23.7
Public 3-&4-room	1260	63.4	63.8	61.3	66.6
Public1-&2-room	180	7.1	6.4	6.6	9.7
Self-perceived money insufficiency					
No	1642	85.8	87.5	84.3	84.9
Yes	288	14.2	12.5	15.7	15.1

Education Level

Education level exhibited a significant association with social isolation across all age groups (p<0.001) (Table 2). Compared to individuals with a high level of education, both young and middle-aged adults with low or middle levels of education demonstrated a higher probability of reporting isolation, given the demographic variables held constant (Table 3, Model 1). Furthermore, including education level in both basic and other SES indicators-adjusted models improved the model fit for both young and middle-aged adults (Table 3). Among older adults, those with a low level of education were at a higher risk of isolation (54%) compared to those with middle or high levels of education (32% and 38%, respectively) (Table 2). However, the inclusion of the variable did not significantly improve the model fit.

Table 2
Proportion of isolated individuals by socioeconomic status indicators by age groups

Characteristics	Young adults (aged 21-44) (n=657)		Middle-aged (aged45-64) (n=776)		Older adults (aged ≥65) (n=497)	
	n	Isolated (%)	n	Isolated (%)	n	Isolated (%)
Education level		*p<.001*		*p<.001*		*p<.001*
High	480	8.0	198	14.7	26	37.6
Middle	157	28.4	389	25.6	177	31.9
Low	20	44.7	189	46.7	294	53.7
Employment status		*p=.070*		*p<.001*		*p=.165*
Employed	534	13.1	589	25.7	102	42.7
Inactive	97	11.5	145	23.8	374	45.1
Unemployed	26	35.0	42	69.4	21	67.1
Personal income		*p<.001*		*p<.001*		*p=.351*
>=SGD5,001	128	5.6	110	10.3	7	37.8
SGD1,501-SGD5,000	350	10.6	296	22.2	46	34.6
<=SGD1,500	179	24.7	370	38.1	444	46.7
Housing type		*p<.001*		*p<.001*		*p<.001*
Public 5-room&above	171	6.8	216	14.4	103	35.7
Public 3-&4-room	437	15.8	492	29.9	331	45.4
Public 1-&2-room	49	25.9	68	69.2	63	68.6
Self-perceived money insufficiency		*p<.001*		*p<.001*		*p<.001*
No	573	10.6	649	22.3	420	39.7
Yes	84	35.9	127	56.0	77	77.3

P-values were obtained by Pearson chi-square tests or Fisher's exact tests.

Employment Status

With adjustment for demographic variables, unemployed young and middle-aged adults exhibited an increased risk of social isolation compared to their employed counterparts (AME%=14.4 and 36.7, respectively). However, this increase in model fit was marginal, with only a 1.0% and 3.6% improvement, respectively (Table

Table 3
AME% of reporting higher probability of isolation than the reference group and model fit stratified by age groups

Socioeconomic variables	Young adults (aged 21-44) (n=657)				Middle-aged (aged 45-64) (n=776)				Older adults (aged ≥ 65) (n=497)			
	AME%	OR	95% CI	p	AME%	OR	95% CI	p	AME%	OR	95% CI	p
Education level												
Model 1[+]	_R² change =8.0%*_				_R² change =8.4%_				_R² change =2.6%_			
High	Ref				Ref				Ref			
Middle	**17.83**	**3.73**	**2.29, 6.06**	**.000**	**12.17**	**2.23**	**1.36, 3.64**	**.001**	5.79	1.30	0.52, 2.24	.572
Low	**29.40**	**6.46**	**2.39, 4.82**	**.000**	**32.11**	**5.57**	**3.25, 9.53**	**.000**	20.29	2.39	0.98, 5.87	.056
Model 2[++]	_R² change =1.6%**_				_R2 change =0.6%_				_R² change =0.7%_			
High	Ref				Ref				Ref			
Middle	**10.29**	**2.37**	**1.36, 4.14**	**.002**	4.49	1.34	0.76, 2.37	.310	-2.36	0.89	0.34, 2.35	.821
Low	11.10	2.51	0.84, 7.48	.100	**11.34**	**1.99**	**1.03, 3.84**	**.040**	5.56	1.29	0.48, 3.45	.609
Employment status												
Model 1	_R² change =1.0%_				_R² change =3.6%_				_R² change =1.5%_			
Employed	Ref				Ref				Ref			
Inactive	4.52	1.43	0.74, 2.75	.289	-0.71	0.96	0.61, 1.53	.870	-6.78	0.75	0.46, 1.22	.247
Unemployed	**14.43**	**2.59**	**1.01, 6.69**	**.049**	**36.67**	**5.11**	**2.54, 10.27**	**.000**	17.18	2.13	0.77, 5.92	.146
Model 2	_R² change = -0.2%_				_R² change =1.7%_				_R² change =0.7%_			
Employed	Ref				Ref				Ref			
Inactive	-3.72	0.69	0.31, 1.54	.361	-4.46	0.75	0.44, 1.27	.287	6.35	0.73	0.42, 1.28	.279
Unemployed	1.16	1.11	0.37, 3.31	.854	**21.87**	**3.17**	**1.46, 6.85**	**.003**	-6.62	1.34	0.45, 4.05	.600
Personal income												
Model 1	_R² change =11.2%_				_R² change =11.9%_				_R² change =0.3%_			
>=SGD5,001	Ref				Ref				Ref			
SGD1,501-SGD5,000	**7.69**	**2.98**	**1.27, 7.01**	**.012**	**12.59**	**3.11**	**1.47, 6.61**	**.003**	13.58	1.86	0.30, 11.32	.502
<=SGD1,500	**24.78**	**9.51**	**3.90, 23.21**	**.000**	**32.63**	**8.60**	**4.04, 18.32**	**.000**	17.68	2.21	0.40, 12.22	.364
Model 2	_R² change =3.5%_				_R² change =1.7%_				_R² change =0.2%_			
>=SGD5,001	Ref				Ref				Ref			
SGD1,501-SGD5,000	4.93	1.88	0.77, 4.60	.164	8.57	1.88	0.84, 4.24	.127	7.89	1.46	0.23, 9.42	.692
<=SGD1,500	**18.73**	**5.41**	**1.92, 15.21**	**.001**	**16.29**	**2.96**	**1.22, 10.38**	**.017**	6.97	1.39	0.23, 8.66	.719

Housing type

	AME	SE	CI	p	AME	SE	CI	p	AME	SE	CI	p
Model 1	R^2 change =3.9%				R^2 change =10.0%				R^2 change =5.4%			
Public 5-room&above	Ref				Ref				Ref			
Public 3-&4-room	**7.40**	**2.08**	**1.11, 3.91**	**.023**	**14.09**	**2.42**	**1.55, 3.78**	**.000**	9.54	1.52	0.93, 2.47	.092
Public 1-&2-room	**17.85**	**4.06**	**1.64, 10.08**	**.003**	**51.87**	**12.46**	**6.26, 24.80**	**.000**	**36.99**	**5.14**	**2.44, 10.83**	**.000**
Model 2	R^2 change =0.6%				R^2 change =2.8%				R^2 change =1.9%			
Public 5-room&above	Ref				Ref				Ref			
Public 3-&4-room	3.34	1.39	0.70, 2.74	.345	6.83	1.55	0.95, 2.53	.079	4.43	1.23	0.2, 2.09	.449
Public 1-&2-room	-0.76	0.92	0.32, 2.66	.877	**29.42**	**4.83**	**2.25, 10.38**	**.000**	**23.17**	**2.89**	**1.27, 6.57**	**.012**
Self-perceived money insufficiency												
Model 1	R^2 change =5.5%				R^2 change =7.4%				R^2 change =9.7%			
No	Ref				Ref				Ref			
Yes	**21.67**	**3.99**	**2.33, 6.81**	**.000**	**32.70**	**4.46**	**2.93, 6.77**	**.000**	**36.61**	**5.34**	**2.96, 9.66**	**.000**
Model 2	R^2 change =1.5%				R^2 change =2.4%				R^2 change =6.9%			
No	Ref				Ref				Ref			
Yes	**11.35**	**2.43**	**1.34, 4.43**	**.004**	**18.65**	**2.72**	**1.73, 4.29**	**.000**	**31.91**	**4.37**	**2.37, 8.07**	**.000**

Note: Results in bold: p<0.0, AME: Average Marginal Effect
+ Model 1 adjusted for age, gender, ethnicity, marital status and living arrangement.
+ + Model 2 adjusted for variables in Model 1 + other four objective SES
* McKelvey & Zavoina's pseudo-R2 change compared to the basic model without that specific indicator of SES
** McKelvey & Zavoina's pseudo-R2 change to model 2 attributed to that specific indicator of SES

3, Model 1). After further adjustment for other SES indicators, this improvement reduced to -0.2% and 1.7%, respectively (Table 3, Model 2). Conversely, there was no significant association between employment status and social isolation among older adults (Table 2).

Personal Income

Young and middle-aged adults with low personal income (SGD1,500 or lower) were associated with social isolation with or without adjustment for demographics or other SES indicators. It contributed to the model fit with the highest magnitude among all the SES indicators (Table 3, Model 1). With inclusion of other SES indicators, personal income still contributed the most to the explained variance in Model 2. Young and middle-aged adults with income of SGD1,500 or lower had an increased probability of isolation than those with income of SGD5,000 or above (AME%=24.8 and 32.6, respectively) (Table 3, Model 2). However, the relationship between personal income and social isolation was not significant in older adults.

Housing Type

A significant association between housing type and social isolation was observed across all three age groups. Including housing type in the basic model contributed to the model fit by 3.9%, 10.0% and 5.4% for young, middle-aged, and older adults, respectively (Table 3, Model 1). After adjusting for other SES indicators,

middle-aged and older adults residing in public 1- and 2-room flats showed an elevated probability of social isolation (AME%=29.4 and 23.2) compared to those residing in public 5-room flats or private properties, contributing to the model fit by 2.8% and 1.9%, respectively (Table 3, Model 2). However, no statistical difference across three housing types was observed in young adults.

Self-Reported Money Insufficiency

Self-perceived money insufficiency was significantly associated with social isolation across all three age groups, even after adjusting for other SES indicators. It contributed to the model fit of the fully adjusted model by 1.5% and 2.4% for young and middle-aged adults, respectively. In older adults, the inclusion of this variable improved the model fit by 6.9%, which was the highest magnitude among all SES indicators (Table 3, Model 2).

Discussion

This study examined the association of four objective SES indicators (including education level, employment status, personal income, and housing type) and one subjective SES indicator (self-perceived money insufficiency) with social isolation, stratified by three age groups. The findings demonstrated significant associations between SES indicators and social isolation, consistent with previous findings (Kung et al., 2022; Lai et al., 2023; Röhr et al., 2022). Different SES indicators exhibited varying associations with social isolation across different age groups. Specifically, education level, personal income, self-perceived money insufficiency, housing type, and employment status were individually associated with social isolation in young and middle-aged adults. In older adults, self-perceived money insufficiency and housing type were individually associated with social isolation. These associations varied in magnitude across age groups, consistent with a prior study (Geyer et al., 2006). The associations remained significant and varied in magnitude within each age group after fully adjusted for other SES indicators, except for employment status and housing type in young adults.

Educational level and personal income were associated with social isolation in young and middle-aged adults, whereas employment status was associated with social isolation in middle-aged adults but not in older adults. These findings suggest that these individual-level objective SES indicators may be more pertinent to young and middle-aged adults than older adults when studying social isolation. Education level, often regarded as a determinant of employment, occupation, and income (Piha et al., 2010), is related to non-material resources such as knowledge and skills, particularly during early adulthood. The consistent association of unemployment with increased odds of social isolation in middle-aged adults may be attributed to the norm of productive employment during this life stage, where the loss of daily contact with colleagues could serve as a mechanism. Additionally, it could also be explained by self-withdrawal from families and friends due to feelings of shame and embarrassment, and/or the need to curtail socializing expenses (Mann, 2012). Unemployment, however, was not associated with isolation in young adults after adjustment for other SES indicators, possibly due to the reasons for unemployment, which determine its impact (Mosca & Barrett, 2016). In the case of young adults, unemployment was predominantly voluntary or temporary, resulting in little impact on social isolation.

In this study, housing type, often considered a proxy of household SES in Singapore, emerged as a significant factor associated with social isolation in middle-aged and older adults. Specifically, individuals residing in public 1- and 2-room flats exhibited a higher probability of social isolation, even after adjusting for other SES indicators. This finding aligns with a study which reported that older adults residing in small-sized housing tend to have higher prevalence of isolation and loneliness (Wee et al., 2019). This suggests that the sensitivity of housing type as an SES indicator and its utility in estimating the impact of SES on social isolation among middle-aged and older adults. Consequently, interventions aimed at addressing isolation issues should consider providing a diverse range of organized group activities tailored to residents of small-sized housing estates.

Furthermore, individuals who perceived money insufficiency for meeting daily living needs consistently exhibited a strong association with the likelihood of social isolation across age groups. This subjective perception of financial insufficiency was found to be a better predictor of social isolation than any of the other objective SES indicators. This suggests that the subjective SES indicator has a more pronounced effect on social isolation than individual objective SES indicators. One plausible explanation for this finding is that individuals having feelings of money insufficiency may develop an inferiority complex, which could negatively impact their personal relationships and social interactions. This highlights the importance of assessing and addressing individuals' subjective perceptions of financial insufficiency in interventions aimed at mitigating social isolation.

The findings align with the conceptual framework proposed by Umberson and Donnelly (2023), which emphasizes that structural systems like economic inequality play a central role in the production of social isolation inequalities. Drawing on Life Course Theory (Elder Jr., 1998), which posits that individuals' experiences and outcomes are shaped by their socioeconomic circumstances and the timing of events across their lifespan, this study demonstrates varying associations between SES indicators and social isolation across different age groups. The association between education and income with social isolation in young and middle-aged adults, but not in older adults suggests that those factors shape social networks in early and middle adulthood, while their influence diminishes in later life, where other factors like housing type become more significant. Cumulative Advantage/Disadvantage Theory (CAD) (Dannefer, 2003), on the other hand, explains the persistent and strong association of perceived money insufficiency with social isolation across all age groups. This theory suggests that advantages or disadvantages accumulate over time, intensifying disparities in later life. The perception of financial insufficiency likely reflects a cumulative experience of economic strain, impacting social relationships and increasing isolation risk throughout life.

Culturally, these findings resonate with Singapore's socio-cultural context. The nation's emphasis on meritocracy and economic success (Tan, 2008) may heighten the association between SES indicators and social isolation among younger adults. Educational and career achievements are highly valued, potentially exacerbating isolation for those with lower SES. The significance of housing type to social isolation among middle-aged and older adults reflects Singapore's public housing policies and their role in social stratification (Chua, 2014). Additionally, the strong association between financial insufficiency and social isolation across all age groups aligns with Singapore's competitive economic environment and high cost of living, amplifying financial stress's impact on social relationships.

This study contributes to the literature by investigating the association between commonly used objective indicators of SES and a subjective indicator of SES with the probability of social isolation across three adult age groups. However, there are several limitations that warrant consideration. Firstly, housing type was utilized as a proxy of household SES, yet ownership of the property or wealth was not accounted for. This may have influenced the findings, particularly as a small proportion of participants were tenants or resided in public rental flats, which have been associated with feelings of loneliness (Wee et al., 2019). Secondly, while efforts were made to disentangle the independent impact of each SES indicator on social isolation by adjusting for other indicators, it is acknowledged that the complex interrelationship between SES indicators may lead to nuanced pathways to social isolation. Merely adjusting for other indicators may not fully capture one indicator's independent impact on social isolation.

The findings suggest that in addition to providing organized group activities for residents of small-sized housing estates, interventions should adopt a life-course approach, tailoring strategies to different age groups based on the most relevant SES indicators. For young and middle-aged adults, programs focusing on education and employment support may be particularly effective in reducing social isolation. For older adults, community-based interventions centered around public housing estates could help foster social connections. Moreover, given the consistent importance of perceived money insufficiency, financial literacy programs and support services

should be integrated into social isolation interventions across all age groups. These could include financial counseling, budgeting workshops, and resources for managing economic stress, which may indirectly benefit social well-being. Lastly, policy makers should consider the interplay between objective and subjective SES indicators when designing social policies. While improving objective socioeconomic conditions is crucial, addressing subjective perceptions of financial adequacy through targeted support and public education may yield significant benefits in reducing social isolation.

Conclusion

The relationship between SES and social isolation is multifaceted, with different SES indicators exhibiting varied associations with social isolation across different age groups. Among the objective SES indicators, personal income explained a greater variance in isolation in young and middle-aged adults, while housing type explained more variance in older adults. Additionally, the subjective SES indicator demonstrated a strong association with isolation across all age groups. These findings underscore the importance of considering multiple dimensions of SES when examining social isolation and highlight the need for tailored interventions to address social isolation effectively across different age groups.

Conflicts of Interest

The Author declares that there is no conflict of interest.

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References:

Bhatti, A. B., & Haq, A. ul. (2017). The pathophysiology of perceived social isolation: Effects on health and mortality. Cureus, 9(1). https://doi.org/10.7759/cureus.994

Braveman, P. A., Cubbin, C., Egerter, S., Chideya, S., Marchi, K. S., Metzler, M., & Posner, S. (2005). Socioeconomic status in health research: One size does not fit all. JAMA, 294(22), 2879–2888. https://doi.org/10.1001/jama.294.22.2879

Braveman, P., & Gottlieb, L. (2014). The Social Determinants of Health: It's time to consider the causes of the causes. Public Health Reports, 129(Suppl 2), 19–31.

Brydsten, A., Hammarström, A., & San Sebastian, M. (2018). Health inequalities between employed and unemployed in northern Sweden: A decomposition analysis of social determinants for mental health. International Journal for Equity in Health, 17(1), 59. https://doi.org/10.1186/s12939-018-0773-5

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. American Psychologist, 54(3), 165–181. https://doi.org/10.1037/0003-066X.54.3.165

Child, S. T., & Lawton, L. (2019). Loneliness and social isolation among young and late middle-age adults: Associations with personal networks and social participation. Aging & Mental Health, 23(2), 196–204. https://doi.org/10.1080/13607863.2017.1399345

Chua, B. H. (2014). Navigating between limits: The future of public housing in Singapore. Housing Studies, 29(4), 520–533. https://doi.org/10.1080/02673037.2013.874548

Cudjoe, T. K. M., Roth, D. L., Szanton, S. L., Wolff, J. L., Boyd, C. M., & Thorpe, R. J. (2018). The epidemiology of social isolation: National Health and Aging Trends Study. The Journals of Gerontology: Series B, gby037. https://doi.org/10.1093/geronb/gby037

Dannefer, D. (2003). Cumulative advantage/disadvantage and the life course: Cross-fertilizing age and social science theory. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 58(6), S327-337. https://doi.org/10.1093/geronb/58.6.s327

DeMaris, A. (2002). Explained variance in logistic regression: A Monte Carlo study of proposed measures. Sociological Methods & Research, 31(1), 27–74. https://doi.org/10.1177/0049124102031001002

Dieckhoff, M., & Gash, V. (2015). Unemployed and alone? Unemployment and social participation in Europe. International Journal of Sociology and Social Policy, 35(1–2), 67–90.

Doshi, T., Smalls, B. L., Williams, J. S., Wolfman, T. E., & Egede, L. E. (2016). Objective and subjective measures of socioeconomic status and cardiovascular risk control in adults with diabetes. The American Journal of the Medical Sciences, 352(1), 36–44. https://doi.org/10.1016/j.amjms.2016.03.020

Durcan, D., & Bell, R. (2015). Reducing social isolation across the lifecourse (2015329). UCL Institute of Health Equity,Public Health England. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/461120/3a_Social_isolation-Full-revised.pdf

Elder Jr., G. H. (1998). The life course as developmental theory. Child Development, 69(1), 1–12. https://doi.org/10.1111/j.1467-8624.1998.tb06128.x

Ge, L., Yap, C. W., & Heng, B. H. (2018). Prevalence of frailty and its association with depressive symptoms among older adults in Singapore. Aging & Mental Health, 1–6. https://doi.org/10.1080/13607863.2017.1416332

Ge, L., Yap, C. W., Ong, R., & Heng, B. H. (2017). Social isolation, loneliness and their relationships with depressive symptoms: A population-based study. PLOS ONE, 12(8), e0182145. https://doi.org/10.1371/journal.pone.0182145

Geyer, S., Hemström, Ö., Peter, R., & Vågerö, D. (2006). Education, income, and occupational class cannot be used interchangeably in social epidemiology. Empirical evidence against a common practice. Journal of Epidemiology and Community Health, 60(9), 804–810. https://doi.org/10.1136/jech.2005.041319

Gouda, K., & Okamoto, R. (2012). Current status of and factors associated with social isolation in the elderly living in a rapidly aging housing estate community. Environmental Health and Preventive Medicine, 17(6), 500–511. https://doi.org/10.1007/s12199-012-0282-x

Heslop, P., Davey Smith, G., Macleod, J., & Hart, C. (2001). The socioeconomic position of employed women, risk factors and mortality. Social Science & Medicine, 53(4), 477–485. https://doi.org/10.1016/S0277-9536(00)00350-6

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. PLOS Medicine, 7(7), e1000316. https://doi.org/10.1371/journal.pmed.1000316

Klinenberg, E. (2016). Social isolation, loneliness, and living alone: Identifying the risks for public health. American Journal of Public Health, 106(5), 786–787. https://doi.org/10.2105/AJPH.2016.303166

Kung, C. S. J., Pudney, S. E., & Shields, M. A. (2022). Economic gradients in loneliness, social isolation and social support: Evidence from the UK Biobank. Social Science & Medicine, 306, 115122. https://doi.org/10.1016/j.socscimed.2022.115122

Lai, E. T. C., Ho, S. C., & Woo, J. (2023). Social isolation, socioeconomic status, and development of functional impairments in Chinese older adults aged 70 years and over: A cohort study. Aging Clinical and Experimental Research, 35(1), 155–165. https://doi.org/10.1007/s40520-022-02259-w

Laugesen, K., Baggesen, L. M., Schmidt, S. A. J., Glymour, M. M., Lasgaard, M., Milstein, A., Sørensen, H. T., Adler, N. E., & Ehrenstein, V. (2018). Social isolation and all-cause mortality: A population-based cohort study in Denmark. Scientific Reports, 8(1), 4731. https://doi.org/10.1038/s41598-018-22963-w

Lubben, J., Blozik, E., Gillmann, G., Iliffe, S., von Renteln Kruse, W., Beck, J. C., & Stuck, A. E. (2006). Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations. The Gerontologist, 46(4), 503–513. https://doi.org/10.1093/geront/46.4.503

Lubben, J. E., Blozik, E., Gillmann, G., Iliffe, S., von Renteln Kruse, W., Beck, J. C., & Stuck, A. E. (2006). Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations. The Gerontologist, 46(4), 503–513. https://doi.org/10.1093/geront/46.4.503

Lubben, J., Gironda, M., Sabbath, E., Kong, J., & Johnson, C. (2015). Social isolation presents a grand challenge for social work (Grand Challenges for Social Work Initiative Working Paper No. 7) [Working Paper]. American Academy of Social Work and Social Welfare. http://grandchallengesforsocialwork.org/wp-content/uploads/2015/12/WP7-with-cover.pdf

Malhotra, R., Malhotra, C., Chan, A., & Østbye, T. (2013). Life-course socioeconomic status and obesity among older Singaporean Chinese men and women. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 68(1), 117–127. https://doi.org/10.1093/geronb/gbs102

Mann, J. L. (2012, August 30). Some thoughts for the unemployed on avoiding the trap of social isolation. Psychology Today. https://www.psychologytoday.com/intl/blog/jobless-not-joyless/201208/some-thoughts-the-unemployed-avoiding-the-trap-social-isolation

McPherson, M., Smith-Lovin, L., & Brashears, M. E. (2006). Social isolation in America: Changes in core discussion networks over two decades. American Sociological Review, 71(3), 353–375.

Menec, V. H., Newall, N. E., Mackenzie, C. S., Shooshtari, S., & Nowicki, S. (2019). Examining individual and geographic factors associated with social isolation and loneliness using Canadian Longitudinal Study on Aging (CLSA) data. PLOS ONE, 14(2). https://doi.org/10.1371/journal.pone.0211143

Mosca, I., & Barrett, A. (2016). The impact of voluntary and involuntary retirement on mental health: Evidence from older Irish adults. The Journal of Mental Health Policy and Economics, 19(1), 33–44.

Nobles, J., Ritterman Weintraub, M., & Adler, N. (2013). Subjective socioeconomic status and health: Relationships reconsidered. Social Science & Medicine (1982), 82, 58–66. https://doi.org/10.1016/j.socscimed.2013.01.021

Norström, F., Virtanen, P., Hammarström, A., Gustafsson, P. E., & Janlert, U. (2014). How does unemployment affect self-assessed health? A systematic review focusing on subgroup effects. BMC Public Health, 14(1), 1310. https://doi.org/10.1186/1471-2458-14-1310

Oakes, J. M., & Rossi, P. H. (2003). The measurement of SES in health research: Current practice and steps toward a new approach. Social Science & Medicine, 56(4), 769–784. https://doi.org/10.1016/S0277-9536(02)00073-4

Piha, K., Laaksonen, M., Martikainen, P., Rahkonen, O., & Lahelma, E. (2010). Interrelationships between education, occupational class, income and sickness absence. European Journal of Public Health, 20(3), 276–280. https://doi.org/10.1093/eurpub/ckp162

Primack, B. A., Shensa, A., Sidani, J. E., Whaite, E. O., Lin, L. Y., Rosen, D., Colditz, J. B., Radovic, A., & Miller, E. (2017). Social media use and perceived social isolation among young adults in the U.S. American Journal of Preventive Medicine, 53(1), 1–8. https://doi.org/10.1016/j.amepre.2017.01.010

Röhr, S., Wittmann, F., Engel, C., Enzenbach, C., Witte, A. V., Villringer, A., Löffler, M., & Riedel-Heller, S. G. (2022). Social factors and the prevalence of social isolation in a population-based adult cohort. Social Psychiatry and Psychiatric Epidemiology, 57(10), 1959–1968. https://doi.org/10.1007/s00127-021-02174-x

Saito, M., Aida, J., Kondo, N., Saito, J., Kato, H., Ota, Y., Amemiya, A., & Kondo, K. (2019). Reduced long-term care cost by social participation among older Japanese adults: A prospective follow-up study in JAGES. BMJ Open, 9(3), e024439. https://doi.org/10.1136/bmjopen-2018-024439

Smith, G. D., Hart, C., Blane, D., Gillis, C., & Hawthorne, V. (1997). Lifetime socioeconomic position and mortality: Prospective observational study. BMJ (Clinical Research Ed.), 314(7080), 547–552. https://doi.org/10.1136/bmj.314.7080.547

Stewart, M. J., Makwarimba, E., Reutter, L. I., Veenstra, G., Raphael, D., & Love, R. (2009). Poverty, sense of belonging and experiences of social isolation. Journal of Poverty, 13(2), 173–195. https://doi.org/10.1080/10875540902841762

Tan, K. P. (2008). Meritocracy and elitism in a global city: Ideological shifts in Singapore. International Political Science Review, 29(1), 7–27. https://doi.org/10.1177/0192512107083445

Torrres-Reyna, O. (2014). Predicted probabilities and marginal effects after (ordered) logit/probit using margins in Stata. Princeton University.

Umberson, D., & Donnelly, R. (2023). Social isolation: An unequally distributed health hazard. Annual Review of Sociology, 49(1), 379–399. https://doi.org/10.1146/annurev-soc-031021-012001

Wee, L. E., Tsang, T. Y. Y., Yi, H., Toh, S. A., Lee, G. L., Yee, J., Lee, S., Oen, K., & Koh, G. C. H. (2019). Loneliness amongst low-socioeconomic status elderly Singaporeans and its association with perceptions of the neighbourhood environment. International Journal of Environmental Research and Public Health, 16(6). https://doi.org/10.3390/ijerph16060967

Whitley, E., & Popham, F. (2017). Leaving the labour market later in life: How does it impact on mechanisms for health? Occup Environ Med, 74(12), 877–886. https://doi.org/10.1136/oemed-2016-104258