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Research Article

Long-term Impact of Childhood Disadvantage on Late-Life Functional Decline Among Older Japanese: Results From the JAGES Prospective Cohort Study

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Abstract

Background: Increasing evidence suggests an impact of childhood disadvantage on late-life functional impairment in Western countries. However, the processes by which childhood disadvantage affects functional capacity are influenced by several factors unique to particular societies. We examined the impact of childhood disadvantage on functional decline among older Japanese, using a large-scale prospective cohort study.
Methods: Data came from surveys conducted in 2010 and 2013 as part of the Japan Gerontological Evaluation Study (JAGES), a nationwide cohort study targeting community-dwelling people aged 65 years and over. Childhood disadvantage included subjective childhood socioeconomic status (SES), body height, and educational level. The sample was stratified by age at baseline (65–69, 70–74, 75–79, and ≥ 80 years).
Results: A total of 11,601 respondents were analyzed. In the 65–69-year group, lower childhood SES was associated with functional decline but this association was mediated by adult SES. In contrast, childhood SES was independently associated with functional decline in the older cohort. In the 75–79-year group, lower childhood SES was associated with functional decline. However, in the ≥ 80-year group, people with higher childhood SES were more likely to experience functional decline. Shorter height was associated with functional decline in the 70–74-year group. Higher education was related to functional decline in all age groups except the ≥ 80-year group.
Conclusions: These findings suggest that childhood disadvantage affects functional decline but its effect varies by age cohort. The mechanisms underlying the association between childhood disadvantage and functional decline may be influenced by social and historical context.

Keywords: Functional decline, Childhood disadvantage, Socioeconomic status, Body height, Education, Japan

Functional decline is a significant contributor to disease burden, resulting in substantial social costs, suffering, and disability. Increasing evidence has indicated the usefulness of a lifecourse perspective on the process of functional decline, focusing on childhood disadvantage. A number of studies have used childhood socioeconomic status (SES), including parental education and occupation, housing quality, and moving because of financial problems, to explore the association with functional decline (1–5). For example, a low level of parental education and the absence of a father during childhood are reported to be significant risk factors for disability in later life (2).

Besides childhood SES, several studies have used adult body height as a proxy for the nutritional and hygienic environment experienced during childhood. It was reported that the most influential nongenetic factors affecting height were nutrition and disease in childhood (6). Previous studies found that shorter height in adulthood was associated with worse mental and physical health (7) and cognitive impairment (7,8) in old age. In addition, educational attainment is partly considered a measure of early life exposure. The relationship between education and health in adulthood is well-established (9).

Taken together, these studies suggest a persisting effect of childhood disadvantage on functional decline in later life. However, most previous studies have been conducted in Western countries. Considering the differences in social, cultural, and historical contexts between Western and non-Western countries, it is important to explore the association between childhood SES and functional capacity in non-Western societies, including Japan. Many older people in Japan experienced potentially harmful situations resulting from war in their early lives, including food shortage, poverty, military enlistment, injury, and the death of family members in the period during and immediately after World War II (WWII) (10–12). These unique historical features of Japan may influence the association between childhood SES and health.

To our knowledge, only one study has examined the association between childhood disadvantage and functional disability in an Asian society (5). The results revealed that, among older Japanese, low subjective childhood SES was associated with limitations in higher-level functional capacity in all age groups, and shorter height was related to functional limitation among those aged 70–74 years. However, these findings were derived from cross-sectional data. Because change in functional capacity is known to be a strong predictor of mortality (13), the relationship between childhood disadvantage and functional decline, measured at two points in time, should be also tested.

The current study examined the impact of childhood disadvantage on functional decline among older Japanese, using data from the Japan Gerontological Evaluation Study (JAGES), a nationwide prospective cohort study targeting community-dwelling older people in Japan. The baseline JAGES survey was conducted among people aged ≥ 65 years in 2010. Most of these participants experienced WWII in their childhood, lasting from 1937 to 1945, as well as the postwar period: people aged 65–69, 70–74, 75–79, and ≥ 80 years in 2010 experienced the end of WWII when they were aged 0–4, 5–9, 10–14, and ≥ 15 years, respectively. Although they experienced potentially harmful situations resulting from war, the age at which these events were experienced differed between age cohorts. Thus, we hypothesized that the influences of these harmful events on functional health would differ by age cohort.

Methods

Study Design and Participants

We used longitudinal data from two surveys conducted in 2010 and 2013 as part of the JAGES. In the 2010 survey, self-report questionnaires were posted to community-dwelling individuals aged 65 years and over, without certified long-term care needs. Participants were sampled from 24 municipalities in nine of Japan's 47 prefectures. The survey was performed using a random sampling method in 14 large municipalities and was administered to all eligible residents in 10 small municipalities (total target population: n = 141,452). The baseline sample in 2010 comprised 92,272 subjects (response rate: 65.2%). Among this sample, after excluding people who died (approximately 5%), those who received certification of long-term care needs (approximately 8%), those who moved to another municipality (approximately 1%), and those who were lost to follow up (approximately 2%) during the follow-up period, 77,714 subjects were targeted in a follow-up survey. A total of 62,438 subjects (80.3%) completed a follow-up self-report questionnaire. The average follow-up period was 2.6 years.

We randomly selected approximately 20% of the participants from the 2010 survey to receive a survey module inquiring about childhood SES. Of 62,438 participants, 14,738 completed this module. Of 14,738 total respondents, we excluded respondents who did not report that they were ≥ 65 years of age, did not report that they had no limitations in basic activities of daily living (ADL), and those who did not provide full responses to the Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG-IC), either in the baseline or follow-up survey. As a result, a total of 11,601 participants were included in the final analysis (the number of participants aged 65–69, 70–74, 75–79, and ≥ 80 years were 4,066, 3,666, 2,361, and 1,508, respectively). The JAGES protocol was approved by the Ethics Committee on Research of Human Subjects at Nihon Fukushi University (No. 10-05).

Functional Decline

Functional capacity is composed of basic ADL and higher-level independence. Because our target population was nondisabled individuals, we used higher-level functional capacity as the only dependent variable in this study. This variable was measured in both 2010 and 2013 using the TMIG-IC, which consists of a 13-item index (score range: 0–13) (14). Higher scores indicate greater independence. To assess functional decline over a 3-year period, we first calculated the score difference between two surveys (the score at baseline minus the score at follow-up). Second, we combined participants exhibiting improved and stable functional capacity during the follow-up period into one category (ie, no change or improvement [= 0]), because the study was primarily focused on functional decline. This measurement framework had a possible score range from 0 to 13, and higher scores indicated greater decline in functional capacity over the 3-year measurement period.

Childhood Disadvantage

Childhood disadvantage was measured by childhood SES, body height, and educational level at baseline. Childhood SES was retrospectively assessed by recalled subjective SES, using a single item with a statement "How would you rate your socioeconomic status when you were aged 15 years, compared with standards at that time?" A previous study using recalled SES showed a strong association with health status, similar to that of objective SES indices, in childhood (15). Responses were indicated on a five-point Likert scale: high, middle-high, middle, middle-low, and low. Because the proportion of responses in the "high" category was small (2.3%), we combined the "high" and "middle-high" categories. In total, we examined four categories in our final analysis (1 = low; 2 = middle-low; 3 = middle; 4 = high/middle-high).

Body height was self-reported, and divided into quartiles for participants of each sex in the analysis (1 = Q1 [shortest]; 2 = Q2; 3 = Q3; 4 = Q4 [tallest]). We recorded educational level using three categories (1 = ≤ 9 years; 2 = 10–12 years; 3 = ≥ 13 years).

Adult SES

Adult SES was assessed by subjective SES at baseline, using a single item with the following statement: "How do you rate your present socioeconomic status compared with current standards?" Similarly to childhood SES, responses were rated on a five-point Likert scale. As for childhood SES, the proportion of responses in the "high" category for adult SES was small (1.0%). Therefore, the "high" and "middle-high" categories were combined into one, and a total of four categories were used in the analysis (1 = low; 2 = middle-low; 3 = middle; 4 = high/middle-high).

Covariates

Baseline data about sex (1 = men; 0 = women), marital status (1 = married; 0 = unmarried), living alone (1 = living alone; 0 = cohabitant), current working status (1 = working; 0 = not working), health behaviors, and comorbidities were used as covariates in our analyses. Information about the sex of all eligible participants was provided by local municipalities, while the other variables were collected in the questionnaire survey. Health behaviors included current smoking status (1 = smoking; 0 = not smoking), regular drinking habits (1 = drinking; 0 = not drinking) and daily walking time (1 = < 30 minutes/d; 2 = 30–59 minutes/d; 3 = 60–89 minutes/d; 4 = ≥ 90 minutes/d). Information on comorbidities included the following 16 diseases: hypertension, cardiovascular disease, cerebrovascular diseases, hyperlipidemia, diabetes mellitus, cancer, gastrointestinal disease, liver disease, respiratory disease, osteoporosis, joint disease, psychiatric disease, vision disorder, hearing disorder, elimination disorder, and sleep disorder. The number of diseases was counted and recorded using four categories (1 = no disease; 2 = one disease; 3 = 2–4 diseases; 4 = ≥ 5 diseases).

Statistical Analysis

Poisson regression analysis was used to examine functional decline as an outcome, because the data distribution was skewed and nonnegative. The sample was stratified by four age groups (65–69, 70–74, 75–79, and ≥ 80 years) to understand differences in the association between childhood SES and functional decline by age. We used a three-step modeling strategy based on previous studies (1,5). First, to understand the individual effects of childhood disadvantage measurements and adult SES, we added sex, baseline TMIG-IC score, and each childhood disadvantage/adult SES, in Model 1 (ie, each childhood disadvantage or adult SES was separately added into the model). Second, because previous studies implied that socioeconomic conditions in childhood partially determined those in adulthood and that adult socioeconomic conditions mediated the association between childhood socioeconomic conditions and health outcomes (16,17), childhood disadvantage and adult SES were controlled simultaneously in Model 2. In Model 3, we additionally adjusted for adulthood covariates. The results of the estimations were shown as nonstandardized coefficients (b). The threshold for statistical significance was set at $p < .05$ (two-tailed). All analyses were performed using IBM SPSS 23.

Results

Participants' mean age was 72.4 ± 5.4 years, and 47.4% of participants were men. The proportions of responses for "high/middle-high," "middle," "middle-low", and "low" were 10.4%, 51.2%, 29.9%, and 8.4% for adult SES, and 13.8%, 42.1%, 29.8%, and 14.3% for childhood SES, respectively. Participants with ≥ 13 years of education constituted 18.9% of the sample. More detailed participant characteristics are shown in Supplementary Table 1. A correlation matrix among baseline variables in four age groups is shown in Supplementary Tables 2–5. We confirmed that subjective childhood and adult SES were positively correlated with objective indicators of childhood disadvantage (ie, body height and educational level).

Tables 1 and 2 show the associations of childhood disadvantage and adult SES with functional decline, stratified by four age groups. In the 65–69-year group, the significant associations of lower childhood SES and taller height with functional decline in Model 1 were attenuated and became nonsignificant, when adjusting for education, adult SES and covariates in Models 2 and 3, while higher adult SES was inversely associated with functional decline. We conducted a mediation analysis to test the indirect effects of adult SES. The results revealed that the mediation effects of adult SES on the associations of childhood SES and body height with functional decline were statistically significant ($p < .001$ and $p = .010$ by Sobel test, respectively), and that adult SES mediated 75.5% of the association between childhood SES and functional decline and 12.8% of the association between body height and functional decline (based on Model 2; Supplementary Table 6). Higher education was independently associated with functional decline. In the 70–74-year group, greater height and more education were inversely associated with functional decline, while childhood SES and adult SES were not in Models 2 and 3.

In the 75–79-year group, participants with higher childhood SES were more likely to exhibit functional decline in Models 1–3. Higher education was also inversely related to functional decline. Finally, in the ≥ 80-year group, although the association between childhood SES and functional decline was significant, it was positive in all models (ie, higher childhood SES was related to greater functional decline). Supplementary Tables 7 and 8 present the results as standardized coefficients (β), instead of nonstandardized coefficients.

We tested the interaction between childhood disadvantage measurements (ie, childhood SES, body height, and education) and baseline functional status in each age group by adding them to Model 3. The interactions were not statistically significant in any age group (data not shown), suggesting that the influence of childhood disadvantage on functional decline did not differ by baseline functional capacity level.

We conducted several sensitivity analyses. First, using the entire sample, we tested the interaction between age and childhood SES on functional decline by adding age and this interaction into Model 4. The interaction was statistically significant ($b = -0.059$, $p < .001$; data not shown), suggesting that consideration of age differences in the association between childhood disadvantage and the outcome was important. Second, an age-stratified analysis only including participants who reported full scores in the TMIG-IC (a score of 13) at baseline was performed, and revealed that the results were consistent (Supplementary Table 9). Third, instead of using the functional decline score in the main results (ranging from 0 to 13), we conducted an analysis based on the normal distribution using a raw score of the score difference between two observational points (ie, ranging from −13 to 13). The results were similar to the main results (Supplementary Table 10).

Discussion

We examined the impacts of childhood disadvantage on functional decline in older Japanese, from a large population-based prospective cohort survey. We found that childhood disadvantage generally affected functional decline in later life but its effect varied by age. Our Japanese sample experienced unique social and historical events in their early lives, such as the period during and immediately after WWII and a time of rapid economic growth in the postwar recovery period. However, the age at which these events were experienced differed by age cohort. Therefore, the differential effect of childhood SES on functional decline might be explained by the social and historical context experienced in early life.

The association between childhood SES and functional decline differed markedly by age cohort. In the 65–69-year group, the significant association between childhood SES and functional decline in Model 1 was attenuated, and became nonsignificant in Model 2

Table 1. Associations of Childhood Disadvantage and Adult Socioeconomic Status With Functional Decline Between Baseline and Follow-up Surveys in the 65–69-Year and 70–74-Year Groups

	Model 1			Model 2			Model 3		
	b	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*
65–69 y									
Childhood SES									
High/middle-high	−0.254	0.103	.013	0.102	0.113	.367	0.184	0.122	.133
Middle	−0.242	0.073	.001	−0.041	0.081	.614	0.002	0.087	.985
Middle-low	−0.205	0.075	.006	−0.085	0.079	.282	−0.060	0.086	.489
Low	Ref.			Ref.			Ref.		
Body height									
Q4 (tallest)	−0.217	0.070	.002	−0.115	0.074	.120	−0.148	0.081	.066
Q3	−0.141	0.072	.048	−0.109	0.075	.149	−0.152	0.082	.065
Q2	−0.020	0.074	.787	0.044	0.077	.571	0.084	0.083	.307
Q1 (shortest)	Ref.			Ref.			Ref.		
Educational level									
≥ 13 y	−0.434	0.073	<.001	−0.394	0.079	<.001	−0.430	0.086	<.001
10–12 y	−0.377	0.057	<.001	−0.330	0.061	<.001	−0.362	0.066	<.001
≤ 9 y	Ref.			Ref.			Ref.		
Adult SES									
High/middle-high	−0.824	0.127	<.001	−0.696	0.135	<.001	−0.762	0.149	<.001
Middle	−0.459	0.089	<.001	−0.364	0.095	<.001	−0.327	0.104	.002
Middle-low	−0.318	0.092	.001	−0.277	0.095	.004	−0.308	0.104	.003
Low	Ref.			Ref.			Ref.		
70–74 y									
Childhood SES									
High/middle-high	−0.342	0.097	<.001	−0.085	0.108	.431	−0.027	0.114	.811
Middle	−0.184	0.072	.011	−0.008	0.080	.924	−0.149	0.087	.089
Middle-low	−0.122	0.074	.100	−0.079	0.080	.322	−0.165	0.087	.057
Low	Ref.			Ref.			Ref.		
Body height									
Q4 (tallest)	−0.376	0.069	<.001	−0.235	0.074	.002	−0.272	0.085	.001
Q3	−0.253	0.069	<.001	−0.183	0.073	.013	−0.097	0.080	.227
Q2	−0.202	0.069	.004	−0.114	0.074	.120	−0.046	0.082	.574
Q1 (shortest)	Ref.			Ref.			Ref.		
Educational level									
≥ 13 y	−0.462	0.075	<.001	−0.349	0.082	<.001	−0.377	0.090	<.001
10–12 y	−0.469	0.057	<.001	−0.412	0.062	<.001	−0.417	0.069	<.001
≤ 9 y	Ref.			Ref.			Ref.		
Adult SES									
High/middle-high	−0.387	0.127	.002	−0.177	0.136	.193	−0.098	0.155	.526
Middle	−0.206	0.093	.026	−0.058	0.101	.566	−0.033	0.118	.778
Middle-low	0.069	0.095	.463	0.188	0.100	.061	0.207	0.116	.054
Low	Ref.			Ref.			Ref.		

Notes: SE = Standard error; SES = Socioeconomic status. Model 1: sex, the score of Tokyo Metropolitan Institute of Gerontology Index of Competence, and each childhood disadvantage/adult SES (separately added into the model) at baseline. Model 2: Model 1 + other childhood disadvantage/adult SES (mutually controlled). Model 3: Model 2 + marital status, living alone, working status, smoking, drinking, walking time, and comorbidities at baseline.

(ie, *b* = −0.254, −0.242, and −0.205 for "high/middle-high," "middle," and "middle-low" in childhood SES in Model 1 became *b* = 0.102, −0.041, and −0.085 in Model 2, respectively). In the mediation analysis, approximately 75% of the association between childhood SES and functional decline was mediated by adult SES in this age group, suggesting that low childhood SES triggered a chain of risk that led to further socioeconomic disadvantage across the life-course (18,19). Participants who were aged 65–69 years in 2010 (at the baseline survey) were 15 years old during the early stages of a period of particularly high economic growth in Japan (mid-1950s to mid-1970s). In this period, a system of lifetime employment became typical among Japanese companies, and universal health insurance coverage was firmly established. The establishment of a range of such social systems led to relatively low intergenerational social mobility until recent years (20), and SES in childhood was closely linked to SES in adulthood in our sample. Therefore, the current findings suggest a chain of risk in younger cohorts, involving an association between childhood SES and greater functional decline, which is mainly explained by adult SES.

The current results suggest that childhood SES may have long-term health consequences among participants aged 75 years and over at baseline. However, the current results revealed that the direction of the association between childhood SES and functional decline was opposite between the 75–79-year and ≥ 80-year groups. Among those aged 75–79 years, higher childhood SES was independently and inversely associated with functional decline, even after adjusting for body height, education, adult SES and other covariates (eg, *b* = −0.229, −0.488, and −0.482 for "high/middle-high," "middle," and

Table 2. Associations of Childhood Disadvantage and Adult Socioeconomic Status With Functional Decline Between Baseline and Follow-up Surveys in the 75–79-Year and ≥ 80-Year Groups

	Model 1			Model 2			Model 3		
	b	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*P*
75–79 y									
Childhood SES									
High/middle-high	−0.403	0.103	<.001	−0.233	0.126	.066	−0.229	0.141	.070
Middle	−0.444	0.082	<.001	−0.412	0.095	<.001	−0.488	0.108	<.001
Middle-low	−0.448	0.087	<.001	−0.414	0.096	<.001	−0.482	0.109	<.001
Low	Ref.			Ref.			Ref.		
Body height									
Q4 (tallest)	−0.225	0.088	.010	−0.145	0.096	.131	−0.096	0.105	.364
Q3	−0.209	0.082	.011	−0.152	0.091	.094	−0.088	0.099	.373
Q2	−0.056	0.078	.476	0.018	0.086	.835	−0.156	0.102	.128
Q1 (shortest)	Ref.			Ref.			Ref.		
Educational level									
≥ 13 y	−0.537	0.095	<.001	−0.559	0.109	<.001	−0.578	0.120	<.001
10–12 y	−0.373	0.073	<.001	−0.231	0.077	.003	−0.252	0.087	.004
≤ 9 y	Ref.			Ref.			Ref.		
Adult SES									
High/middle-high	−0.330	0.142	.020	−0.017	0.159	.915	0.073	0.185	.695
Middle	−0.359	0.105	.001	−0.119	0.117	.313	−0.016	0.140	.909
Middle-low	−0.173	0.109	.111	−0.038	0.118	.748	0.039	0.140	.781
Low	Ref.			Ref.			Ref.		
≥ 80 y									
Childhood SES									
High/middle-high	0.237	0.106	.025	0.417	0.130	.001	0.607	0.158	<.001
Middle	0.161	0.092	.079	0.276	0.112	.014	0.443	0.138	.001
Middle-low	0.140	0.097	.148	0.163	0.114	.152	0.322	0.139	.021
Low	Ref.			Ref.			Ref.		
Body height									
Q4 (tallest)	0.079	0.092	.386	−0.002	0.105	.985	−0.060	0.119	.613
Q3	0.147	0.084	.081	0.176	0.092	.056	0.074	0.109	.495
Q2	−0.022	0.074	.763	−0.027	0.083	.741	0.008	0.097	.935
Q1 (shortest)	Ref.			Ref.			Ref.		
Educational level									
≥ 13 y	−0.221	0.088	.012	−0.299	0.100	.003	−0.213	0.111	.088
10–12 y	−0.084	0.065	.200	−0.167	0.077	.029	−0.134	0.091	.143
≤ 9 y	Ref.			Ref.			Ref.		
Adult SES									
High/middle-high	0.183	0.136	.177	0.140	0.152	.359	0.059	0.182	.746
Middle	0.068	0.112	.546	0.031	0.125	.801	−0.113	0.153	.460
Middle-low	0.147	0.117	.209	0.084	0.128	.513	−0.034	0.155	.824
Low	Ref.			Ref.			Ref.		

Notes: SE = Standard error; SES = Socioeconomic status. Model 1: sex, the score of Tokyo Metropolitan Institute of Gerontology Index of Competence, and each childhood disadvantage/adult SES (separately added into the model) at baseline. Model 2: Model 1 + other childhood disadvantage/adult SES (mutually controlled). Model 3: Model 2 + marital status, living alone, working status, smoking, drinking, walking time, and comorbidities at baseline.

"middle-low" in Model 3). For people in this age group, childhood occurred during and immediately after WWII. Many of these participants experienced food shortage, poverty, military service, injury or the death of family members in the war during this period (10–12,21). Thus, the current results may be explained by "biological embedding," the process by which the effects of experience become deeply embedded and alter human biology and development (22,23). Systematic differences in social environments can thus lead to different biological and developmental outcomes. These outcomes can influence health, well-being, learning, and behavior across the life cycle. Therefore, extreme childhood experiences during and after WWII among those aged 75–79 years may have caused a difference in the relationship between childhood SES and functional decline compared with the younger cohort.

In contrast, in the ≥ 80-year group, higher childhood SES was independently associated with more severe functional decline (eg, *b* = 0.607, 0.443, and 0.322 for "high/middle-high," "middle," and "middle-low" in Model 3). Such a paradoxical association has not been reported in Western countries, but is consistent with a previous finding regarding the relationship between childhood SES and mortality among older Japanese (24). These findings may be related to the existence of a survival bias caused by the war. People in this cohort were aged 15 years and over at the end of WWII. In Japan, during WWII, participants in this age cohort were generally targeted for enlistment. However, inequalities in educational and occupational backgrounds with regard to enlistment and mortality have been reported: high educational level, white-collar occupation, and parental white-collar occupation were correlated with a reduced likelihood of enlistment and lower mortality (12,21). Moreover, people with low-SES are more likely to have suffered from poverty even after WWII, as well as being more likely to serve in the military and die during the war and postwar periods. In spite of these inequalities, those who responded that their childhood SES was low, but who lived to be 80 years old and over in 2010 had survived a challenging period. Consequently, they may have been more likely to be healthy than their higher-SES counterparts. Supporting this interpretation, the significant association between higher education and less functional decline in the other age groups was not observed in the ≥ 80-year group. Although many studies have reported that the experience of war has various physical and psychological impacts (25–27), people surviving for more than 65 years after a war may thus be particularly physically and mentally strong.

In terms of body height, taller height was inversely associated with functional decline among participants aged 70–74 years (ie, those who were 5–9 years old at the end of WWII). This finding is consistent with a previous study (5). Nutrition in early childhood is considered one of the most potent nongenetic factors affecting body height (6). From 1943 to 1947 (during and immediately after WWII), Japan experienced unprecedented food shortages. Intake of protein, fat, and calcium was very low, and malnutrition was common throughout the country (10). The current results may indicate the influence of severe nutritional deficiency in the prepubertal period on functional decline in later life.

In addition, higher educational level was inversely associated with functional decline in all age groups except the ≥ 80-year group. Although educational opportunities among older Japanese differed between age cohorts (28), the effect of educational attainment was consistent across age cohorts among people ≤ 79 years in 2010.

The current study contained several limitations that should be considered when interpreting the results. First, we assessed childhood SES retrospectively. Although the validity of using retrospective assessment of childhood SES has been confirmed in studies of lifecourse epidemiology (29), its effect on the outcome might be underestimated (30). Second, other forms of childhood disadvantage, such as parental death, divorce, and abuse, should be examined in future. It will also be important to consider the multidimensional and time-varying nature of adult SES. Previous studies suggest that the association between childhood socioeconomic conditions and health outcomes in adulthood can be partially explained by socioeconomic conditions in adulthood (16,17). Therefore, the analyses were adjusted for current adult SES. However, future studies should consider diverse forms of both childhood and adulthood disadvantage to further elucidate the mechanisms by which childhood disadvantage affects functional decline, and the factors mediating the association. Third, we excluded participants with any disability in basic ADL at baseline. In addition, we excluded those who did not respond to either the baseline or follow-up surveys in our analysis. However, people with low functional capacity, childhood disadvantage and/or low adult SES may be less likely to respond to surveys. Thus, the current results may have underestimated the associations between childhood disadvantage and functional decline.

In conclusion, childhood disadvantage was associated with functional decline in later life but its effect differed by age cohort. To our knowledge, this is the first study to explore the relationship between childhood disadvantage and functional decline in a non-Western population using a data from large-scale prospective cohort study. Older Japanese people experienced unique social and historical events earlier in their lives, but the age at which these events were experienced differed by age cohort. Our findings suggest that the mechanisms underlying the association between childhood disadvantage and functional decline may have been influenced by social and historical context, and that the impact of disadvantage in early life may not be transferable to other societies/populations.

Supplementary Material

Supplementary data is available at *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* online.

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Conflict of Interest

None declared.

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