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Objective and Subjective Childhood Socioeconomic Disadvantage and Incident Depression in Adulthood: A Longitudinal Analysis in the Sister Study

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Abstract

Understanding of the role of objective versus subjective childhood socioeconomic disadvantage (SD) in depression onset in adulthood among women, independent of later life SD, and across birth cohorts, is limited. We examined the association between objective (i.e., household education level) and subjective (i.e., rank of family income and report of not enough food to eat) SD during childhood and diagnosis of clinical depression after age 30 among 47,055 women in the Sister Study. We used Cox proportional hazard models adjusting for women's race/ethnicity, childhood household composition, mother's age at her birth, adulthood educational attainment, and calendar year of birth. Analyses were repeated stratified by 10-year birth group. A total of 8,036 (17.1%) women were diagnosed with depression over a mean follow-up of 24.0 (± 9.9) years. Those reporting being poor (versus well-off) or not having enough food to eat in childhood had a 1.28 (95% confidence interval (CI) 1.13, 1.44) and 1.30 (95% CI 1.21, 1.41) times higher rate of depression diagnosis, respectively, with consistent associations observed across birth year groups. An inverse association between low household education level and incident depression was observed at baseline (i.e., age 30) becoming positive over time in the total sample but only among women born between 1935–1954 in analyses stratified by 10-year birth group. Our findings suggest that subjective SD in childhood is a largely consistent predictor of depression onset among women in adulthood whereas the effects of household education level in childhood may vary across women born into different birth cohorts, and for some, across the lifecourse.

Keywords

Childhood; socioeconomic disadvantage; lifecourse; depression

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Conflict of Interest Statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Background

In the U.S., it has been estimated that 20.9% of adults ages 18–64 will experience a major depressive episode and 18.3% will suffer from major depressive disorder in their lifetime.[1] Depression not only has immediate adverse consequences for psychosocial functioning[2], individuals who experience depression in adulthood have a greater incidence of other chronic health conditions such as cardiovascular disease[3], diabetes[4] and cancer.[5] Indeed, depression is predicted to become the leading cause of disability worldwide by 2030.[6] The burden of depression has also been shown to be greater among women, who are more than twice as likely to be diagnosed with depression beginning in adolescence[7], warranting further investigation into the lifecourse factors that influence onset of depression, among women in particular.

Early life socioeconomic disadvantage (SD) has been proposed to influence onset of depression later in life across several dimensions of socioeconomic status and via several pathways.[8–28] Parental educational attainment, an objective measure of early life socioeconomic status that is often correlated with parental occupation and income, has been hypothesized to increase risk for later life depression[8,12,15,22,26], via shaping factors that have been linked to adverse mental health in adulthood such as availability of material resources, adoption of adverse health behaviors and/or levels of psychosocial stress in both parents and children. Psychosocial stress experienced by individuals who report perceived SD relative to others in childhood, may also influence depression onset later in life via similarly triggering adoption of adverse coping behaviors linked to depression or by programming individuals for heightened stress response in adulthood.[10,15,22–25] Findings regarding the contribution of objective versus subjective SD experienced in early life, on depression onset later in adulthood, as well as whether effects of childhood SD on later life depression persist, independent of socioeconomic position in adulthood, have, however, been mixed.[8–28] For these reasons, questions remain as to the relative importance of actual versus perceived SD in childhood for shaping onset of depression in adulthood and whether depression occurring in adulthood among those that experience SD in early life reflects a critical period effect of SD during childhood on later life mental health.[29]

Despite well-documented gender differences in depression in the U.S.[7], only a subset of existing studies examining the effects of early life SD on adulthood depression, have assessed these associations among women, specifically.[9,12,16,22,24,25,27,28] In addition, while researchers have posited that the effects of education on health may change over the lifecourse[30], and have changed more broadly across birth cohorts[31], studies assessing such effects have to date primarily focused on adulthood educational attainment and physical health outcomes.[32] Taken together, there is a need to better understand the intergenerational effects of childhood SD on later life depression onset among women, over the lifecourse and across those born into different birth cohorts.

The aim of this study, therefore, was to assess the association between both objective (i.e., highest level of household education at age 13) and subjective (i.e., rank of family income relative to others and report of not enough food to eat) measures of SD during childhood and clinical depression diagnosis beginning at age 30, independent of later life educational

attainment, and across women born into different birth cohorts, utilizing data on from ~50,000 US women aged 35–74 years in the Sister Study.

Methods

Study Population

Participants were from the Sister Study, a prospective cohort of 50,884 women aged 35–74 years living in the US who had at least one full or half-sister previously diagnosed with breast cancer but had not had breast cancer themselves at time of enrollment.[33] During enrollment (2003–2009), women completed a computer-assisted telephone interview in which they provided data on demographic characteristics including measures of socioeconomic status in early and mid-life, personal health histories including whether they had ever been diagnosed with clinical depression and date of diagnosis as well as information on other covariates of interest. Our analysis is limited to 49,308 (96.9%) women with no missing data on highest level of parental education at age 13, rank of family income relative to others, or report of not enough food to eat anytime during childhood as well as no missing data on history of clinical depression diagnosis, date of diagnosis (cases only) and other covariates of interest including age at time of enrollment interview, race/ethnicity, mother's age at time of birth, household composition at age 13, and highest level of educational attainment in adulthood. Of these women, 2253 (4.6%) who reported diagnosis with clinical depression before age 30 were excluded in order to assess the relationship between childhood SD and depression onset in adulthood, independent of one's own educational attainment, which is likely to be completed by this age. Enrollment interview data from the remaining 47,055 women were used to identify individuals diagnosed with clinical depression from age 30 up until date of enrollment in the Sister Study. The study was approved and overseen by the institutional review boards of the National Institute of Environmental Health Sciences and the Copernicus Group. The data presented here was from Sister Study data release 6.0.

Measures

Individuals were categorized as a case of depression as of reported date of diagnosis or censored at the end of follow-up (i.e., enrollment interview). Highest level of education in the household at 13 years of age was categorized as < high school, high school degree or GED, some college and ≥ Bachelor's degree. Women were asked to rank their family income level the majority of time growing up as "well-off (referent), middle income, low income or poor" and report whether there was ever a time when their family "did not have enough to eat" during childhood (yes or no). Factors considered potential confounders of the associations of interest included women's race/ethnicity (categorized as non-Hispanic White, non-Hispanic Black, Hispanic or other), mother's age at time of participant's birth (continuous years), and household composition at 13 years of age (categorized as two parent, single parent or other). Women's highest level of educational attainment (categorized as < high school, high school degree or GED, some college, or ≥ Bachelor's degree) was adjusted for to account for her socioeconomic position in mid-life.

Statistical Analysis

Descriptive characteristics (i.e., means for continuous variables and proportions for categorical variables) of the study sample were estimated and Cox proportional hazard models were used to estimate the hazard ratio (HR) and 95% confidence interval (CI) for the association between childhood SD and clinical depression diagnosis after age 30. Years from age 30 to age at date of diagnosis or censoring as of date of enrollment interview was used as the time-scale. Proportional hazards were assessed via graphical assessment of the log(-log(survival)) versus log of survival time plot for each covariate and via inclusion of interaction terms between each covariate and time. If the proportional hazards assumption was not met for a given covariate, interaction terms were retained in the final model. All models were adjusted for covariates considered as potential confounders including women's race/ethnicity, mother's age at time of participant's birth and household composition at age 13. The model for rank of family income during the majority of childhood was additionally adjusted for parent's highest level of education at age 13. The model for report of enough food to eat during childhood was additionally adjusted for both family income relative to others during majority of childhood and highest level of household education at age 13. Models were then adjusted for women's own educational attainment to assess whether associations remained after accounting for mid-life socioeconomic position. Calendar year of birth was also adjusted for in all models. Last, we carried out analyses stratified by 10-year birth groups (i.e., 1925–1934, 1935–1944, 1945–1954, 1955–1964 and 1965–1974) to assess whether associations of interest varied across women born into different birth cohorts. Analysis were conducted using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

Characteristics of women included in the analyses (N=47055) are reported in Table 1. The mean age at time of interview was 55.8 ± 8.9 years, the majority of women self-reported their race/ethnicity as non-Hispanic white (84.4%) and had a bachelor's degree or higher (65.3%). The mean age of women's mothers at time of their birth was 28.5 ± 6.1 years and the majority of women lived in a two-parent household at age 13 (89.6%). A total of 18.4% of women reported that the highest level of education in their household at age 13 was < High School, approximately one third of the sample assessed their family income during childhood as poor (7.8%) or low income (26.0%) and 9.1% of women reported having not enough food to eat sometime during childhood. Women contributed a mean of 24.0 ± 9.9 years (range 1–45.6) of follow-up time, and 17.1% of women were diagnosed with clinical depression after age 30 years.

Sample characteristics for those born in each 10-year birth group (i.e., 1925–1934, 1935–1944, 1945–1954, 1955–1964, and 1965–1974) are also reported in Table 1. Those born between 1945 and 1954 make up the largest proportion of the sample (38.8%) and mean age at time of interview was 72.9 (±1.5), 66.1 (±3.0), 56.7 (±3.1), 47.6 (±3.1), and 39.3 (±2.2), across the groups. A total of 11.6%, 14.8%, 20.0%, 17.1%, and 10.1% were diagnosed with clinical depression and mean years of follow-up were 41.2 (±6.3), 34.0 (±6.9), 24.5 (±6.1), 16.2 (±4.2), and 8.9 (±2.5), among those born between 1925 and 1934, 1935–1944, 1945–1954, 1955–1964, and 1965–1974, respectively.

The associations between all three measures of childhood SD and clinical depression diagnosis after age 30 are reported in Table 2. The proportional hazards assumption was not met for the association between highest level of household education at age 13 and diagnosis of clinical depression; thus an interaction between this variable and time was included in the models. At the start of follow-up (i.e., age 30 years), there was an inverse association between lower household education level at age 13 (i.e.,<high school or high school) and incident clinical depression diagnosis, compared to those with bachelor's degree or higher (HR 0.78, 95% CI: 0.68, 0.90 and HR 0.78, 95% CI: 0.70, 0.87, respectively). However, these inverse associations became positive after ~ 15 and ~17 years of follow-up, respectively (data not shown). The association between highest level of household education at age 13 and incidence of clinical depression diagnosis, stratified by 10-year birth group is shown in Table 3. A similar time-varying association between low household educational attainment at age 13 (i.e., < high school) and clinical depression diagnosis among women born in the 1935–1944 and 1945–1955 birth year groups was observed (see Table 3). The inverse associations for highest level of household education at age 13 of < high school and high school compared to bachelor's degree or higher observed at age 30 years became positive after ~ 27 and ~28 years of follow-up, respectively, among women born into the second oldest birth year group (i.e., 1935–1944) (data not shown). Among women born between 1945 and 1954, inverse associations for highest level of household education at age 13 of < high school, high school and some college, compared to Bachelor's degree or higher were observed up to ~ 15, ~ 17 and ~14 years of follow-up, respectively, and then became positive (data not shown). A non-time varying, positive (although not statistically significant) association between low household education at age 13 and clinical depression diagnosis among women was observed among those born into the most recent birth year group (i.e., 1965–1974) and those born into the oldest birth year group (i.e., 1925–1934) (see Table 3). No association was observed among those born between 1955 and 1964. In further sensitivity analyses, comparing those born in 1954 or earlier to those born in 1955 or later, we also identified a statistically significant time-varying inverse association among women from earlier birth years and a positive (though not statistically significant) association among women born into the two more recent birth year group (data not shown).

Compared to those who reported their family income as well-off, those who reported their family income as poor during the majority of childhood had a 1.28 (95% CI 1.13, 1.44) times higher rate of clinical depression diagnosis in adulthood, adjusting for race/ethnicity, mother's age at time of participant's birth, household composition at age 13 and highest level of household education at age 13 as well as calendar year of birth. This association was not attenuated after additional adjustment for women's own educational attainment (see Table 2). In analyses stratified by 10-year birth group, we found there was a consistent positive association between lower family income relative to others and diagnosis of depression after age 30 across all groups (statistically significant among those born between 1955–1964 only) except among women born between 1965–1974 (see Table 3). Women who reported ever not having enough to eat during childhood, had 1.30 times higher (95% CI 1.21, 1.41) rate of clinical depression diagnosis after age 30, in the fully adjusted model. When the association was estimated among women born into each 10-year birth group separately, there was also a positive association between not having enough to

eat during childhood and incident clinical depression diagnosis after age 30 across all strata (statistically significant among those born between 1935–1944, 1945–1954, and 1955–1964) (see Table 3).

Discussion

Among middle- to older-aged US women enrolled in the Sister Study, we found that low rank of family income relative to others during majority of childhood and report of not having enough food to eat in childhood was associated with ~ 30% higher rate of clinical depression diagnosis after age 30, and these associations persisted even after adjustment for adulthood educational attainment and were largely consistent across all 10-year birth groups. In contrast, we observed a time-varying association for highest household education level at age 13 whereby lower levels of household educational attainment was initially inversely associated with later life diagnosis of clinical depression at age 30, but became positively associated with depression diagnosis over time. The time-varying inverse association was only observed among women born into the 1935–1944 and 1945–1954 birth year groups in stratified analyses, whereas there was a positive (though not statistically significant) non time-varying association among women born between 1925–1934 and 1965–1974, suggesting differences in the effect of household education level during childhood on later life depression across women exposed to childhood SD during different historical periods, which for some groups, also changed over the course of follow-up.

We are only aware a few studies which have examined the association between parental educational attainment in childhood and later life depression among women specifically.[12,22,25,27] In a study by Laaksonen et al.[22], the authors found, similar to our study, an inverse association between low parental education and depressive symptoms in adulthood among women aged 45–60 years in 2000–2001, which persisted after adjustment for self-reported economic difficulties during childhood as well as household income, educational attainment, occupation and economic difficulties in adulthood. In contrast, Nicholson et al., found that low paternal education level during childhood was associated with elevated depressive symptoms among middle-aged women in two Polish and Russian cohorts who were born between 1930–1960, adjusting for age only.[12] Two other recent studies used number of books women had access to at age 10 as a proxy for parental education level, identifying a positive association between owning ≤ 10 books and current depressive symptoms in adulthood among women born before ~1955 (mean age 65.8) enrolled in the Survey of Health, Aging and Retirement in Europe, even after controlling for educational attainment and experience of financial hardship in adulthood. [25, 27]

Given prior studies[12,22,25,27] assessed the association between parental education level in childhood and current depressive symptoms among women at a single point in time and not separately among women born into different birth cohorts, it is possible that any differences in the effect of lower parental educational attainment in childhood on depression later in life across women who experienced objective SD during different historical periods and/or time-varying effects that exist went undetected. The time-varying inverse association between lower household education level at age 13 and incident clinical depression diagnosis after age 30 observed in our study was of note, only observed women born between 1935–1954

in analyses stratified by 10-year birth group. Baker et al. suggest such counter-gradients in health may reflect, in part, shifts in the relationship between education level and adverse health behaviors or lifestyle factors over time Baker et al.[31] For example, the authors estimated a positive relationship between education level and tobacco use in the first half of the twentieth century in the US, which reversed by 1970.[31] Parental tobacco use during childhood, has in turn been linked to later life depression, either directly via critical period exposure to second hand smoke[34] or indirectly by influencing adoption of smoking among individuals in adulthood.[35] Thus, changes in the relationship between education level and uptake of smoking over time provide one possible explanation for differing associations between low household education during childhood on later life depression across women born into different birth cohorts in our study.

There is also evidence that earnings inequality across levels of educational attainment has changed across birth cohorts and over time within cohorts[36,37]; thus our findings may also reflect differences in the extent to which low household educational attainment has translated to deprivation of material resources during childhood and subsequently increased risk for depression onset in adulthood among women born into different birth cohorts in our study. It is also possible that had we assessed objective SD via measuring parental education level in combination with other aspects of material deprivation, a more consistent positive association may have emerged as this has been observed among women later in life, even after adjustment for adulthood SD, in previous studies.[9,16] Last, while there was no statistically significant association between parental educational attainment and later life depression among women born into the oldest and youngest 10-year birth groups, there may still be indirect effects via pathways not assessed in our study, as has been observed with other measures of objective SD.[38] Overall, our results suggest future studies that aim to clarify the mechanisms by which parental education level and potentially other measures of objective SD in childhood may shape risk for later life mental health outcomes in adulthood differently among women born into different birth cohorts and across the lifecourse are warranted.

Our findings regarding the relationship between subjective SD during childhood and depression in adulthood are consistent with three recent studies of which we are aware that assessed similar associations among women.[22,24,28] Morrissey et al. found that British women aged 18–85 years (mean age 42.9 years) who reported their parent's income when they were of age 14 was much lower than others or in the bottom 25% had higher scores on the Goldberg Anxiety and Depression Scale, compared to those who reported it as much higher or in the top 25%.[24] This association persisted after adjusting for income level in adulthood.[24] In the study by Laaksonen et al.[22] as well as another study carried out among women aged 18–80 years in Sweden by Lindstrom et al.[28], the authors also found an association between report of 'serious or continuing financial problems before age 16' or 'economic hardship during childhood' (of variable severity and duration), respectively, and current depressive symptoms in adulthood, adjusting for later life SD. Our findings are also consistent with several other studies that have identified an association between subjective SD in childhood and later life depression among samples of women and men combined.[10,15,18,23] Together with this body of literature, our findings suggest that subjective SD in childhood is a consistent risk factor for later life depression among women

from different populations and largely across those born into different birth cohorts as well as across the lifecourse.

To our knowledge, previous studies examining the association between report of food sufficiency and depression among women have primarily been cross-sectional or assessed longitudinal associations across childhood or adulthood only.[39] We observed a consistent positive association between report of not enough food to eat anytime during childhood and incident depression in the total sample and across women born into different birth year groups. To the extent that self-report of not enough food to eat in childhood reflects perceived disadvantage relative to others, as conceptualized in the present study, the increased rate of clinical depression diagnosis in adulthood observed in our sample further supports a relationship between subjective SD in early life and depression onset in adulthood. Indeed, there could be long-term adverse psychological effects related to shame or embarrassment associated with feeling one did not have enough to eat in childhood, regardless of actual food sufficiency.[40]

It is also possible that self-report of not enough food to eat during childhood among women in our sample reflects *actual* (not just perceived) sufficiency of food available in early life, and thus captures objective SD. Inadequate quantity of food and/or reliance on less expensive calorie dense/nutrient poor foods may, indeed, contribute to later life depression via programing of impaired metabolic function and subsequent obesity in adulthood[41], a condition for which depression is a common sequelae.[42] Moreover, psychological stress related to persistent hunger in those without adequate food to eat in childhood may also contribute to onset of depression in adulthood outside of nutrient-based pathways.[43] The correlation between household education level at age 13 and report of not enough food to eat any time during childhood was, however, lower (polychoric correlation = −.3165) compared to with relative family income (polychoric correlation = −.5989), however, suggesting report of ever not having enough food to eat reflects subjective assessment of SD in childhood. Overall, additional studies aimed at clarifying the physiological and psychological pathways by which actual as well as perceived sufficiency of food in early life shapes risk for depression across the lifecourse are needed.

Limitations

There are a few limitations to our study that should be considered. First, women in the Sister Study were asked to recall both history of clinical depression diagnosis and measures of childhood SD at time of enrollment into the cohort and thus responses are subject to recall bias. Women born into older birth cohorts for whom the most time had passed since childhood at the time of interview, may in particular, suffer from inaccurate recall of information from early life, as age-related declines in episodic memory are well-documented.[44] Studies have also demonstrated more severe age-related memory impairment among those who exposed to SD in childhood.[45,46] Taken together, it is possible that women who were older at the time of interview and/or those who experienced early life SD have differential recall of their childhood environment as well as history of clinical depression diagnosis, though the direction of potential misclassification is not necessarily clear. There may also be differences in recall of childhood SD according to whether

individuals *perceived* themselves to be disadvantaged relative to others in childhood, as individuals are more likely to feel confident in their memory of events that evoke negative emotions, but not necessarily report information related to these events more accurately.[47] We might expect, however, that if negative emotions are evoked among women who rank their level of SD in childhood as higher relative to others, that this would cause them to overestimate and not underestimate their level of objective childhood SD. In that case, there would be greater concordance and not discordance in findings across these measures of childhood SD.

Women who were currently depressed may also recall their childhood differently, compared to those with no history of depression.[48] Of note, approximately 64% of women who reported a clinical depression diagnosis after age 30 reported taking medication for depression at the time of interview and an additional 13.2% reported taking medication for depression in the past 12 months. Moreover, only 2.8% of cases of incident clinical depression were diagnosed in the past year, and of these women, 86.3% were currently taking medications for depression at time of interview. Thus, the majority of women who had been diagnosed with depression in our sample were receiving treatment for any current symptoms when they were asked to recall their childhood circumstances. In addition, in sensitivity analyses in which we excluded those diagnosed in the last year (N = 226), we observed no difference in associations across all measures of childhood SD (data not shown), suggesting that results were not affected by inclusion of women with recent onset of symptoms.

Second, because women began follow-up upon turning 30 years of age anytime over a 45-year period, women from more recent birth cohorts, *de facto* drop-out of the at-risk pool sooner than women from older birth cohorts and, therefore, the composition of the study cohort changes substantially over the follow-up period. For example, after the first ~10 years of follow-up, 66.9% of women from the most recent birth cohort (born between 1965–1974) who have a mean follow-up of 8.9 (± 2.5) years (range 1–14.3) had exited the at-risk pool. While our findings in the overall sample must be interpreted in this context, we account for potential informative censoring via adjusting for calendar year of birth and analyses stratified by 10-year birth groups provide further insight regarding the extent to which the associations examined may vary across women born into different birth cohorts and with different lengths of follow-up.

Third, the sample consists primarily of women of non-Hispanic White race/ethnicity and relatively high socioeconomic position, and all women in the sample have a sister with a history of breast cancer; thus there may, therefore, be limits to the generalizability of our findings to US women broadly. Indeed, previous studies have identified that individuals with family members that have cancer, and sisters of women with breast cancer in particular, experience increased psychological distress.[49] Of note, however, the overall incidence of clinical depression diagnosis among women in our sample (17.1%) is comparable to other national estimates of depression among adult women.[50] Moreover, given median age of breast cancer diagnosis in U.S. women is 62 years[51], and the upper quartile for age at diagnosis was 51 years among women diagnosed with depression in our study, the majority of women were likely diagnosed with depression before the onset of their sister’s breast

cancer. Last, given early life SD has been linked to breast cancer diagnosis in adulthood across numerous studies[52,53], diagnosis of breast cancer in a women's sister, with whom a participant shared the early life environment, even if a trigger for their own onset of depression, would be considered on the pathway between early life SD and diagnosis of depression in adulthood. Taken together, the association between childhood SD and later life depression among women in our study can be generalized to other study populations of women, with or without a sister who was diagnosed with breast cancer.

Conclusion

Overall, this study represents the largest US based cohort study to date, with the longest period of follow-up (mean 24.0 years) of which we are aware, to assess the relationship between both objective and subjective childhood SD and incident clinical depression diagnosis among women, accounting for adulthood educational attainment, and to assess whether associations vary across women born into different birth cohorts. Our findings suggest a largely consistent association between subjective childhood SD and diagnosis of clinical depression in adulthood among women in the US, independent of later life educational attainment. In contrast, a time-varying inverse association between lower household education level and diagnosis of clinical depression was observed in the total sample and women born between 1935–1954 in analyses stratified by birth year group, suggesting there may be variation in the association between objective SD in childhood and later life depression among women who experienced objective SD during different historical periods. Taken together, our findings provide further support that the long-term effects of SD experienced in childhood on mental health should be taken into account in identifying women at risk of depression onset in adulthood, and highlight that these effects may vary by experience of subjective versus objective SD, as well as across women born into different birth cohorts and for some across the lifecourse.

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Table 1.

Characteristics of Women in the Sister Study Assessed for At Least One Measure of Childhood Socioeconomic Disadvantage in the Total Sample and Across 10-Year Birth Groups

Characteristics	Total (N=47,055)	1925–1934 (N=1582)	1935–1944 (N=11087)	1945–1954 (N=18256)	1955–1964 (N=13150)	1965–1974 (N=2980)
Age at time of interview, mean (± SE)	55.8 (8.9)	72.9 (1.5)	66.1 (3.0)	56.7 (3.1)	47.6 (3.1)	39.3 (2.2)
Race/ethnicity, N (%)						
Non-Hispanic White	39724 (84.4)	1464 (92.5)	10010 (90.3)	15483 (84.8)	10596 (80.6)	2171 (72.9)
Non-Hispanic Black	3925 (8.3)	47 (3.0)	536 (4.8)	1522 (8.3)	1404 (10.7)	416 (14.0)
Hispanic	2205 (4.7)	33 (2.1)	293 (2.6)	794 (4.4)	782 (6.0)	303 (10.2)
Other	1201 (2.6)	38 (2.4)	248 (2.2)	457 (2.5)	368 (2.8)	90 (3.0)
Mother's Age at Time of Birth, mean (± SE)	28.5 (6.1)	28.2 (6.3)	28.0 (5.9)	28.2 (5.9)	29.0 (6.3)	29.9 (6.4)
Household Composition at age 13, N (%)						
Two-parent	42156 (89.6)	1431 (90.5)	10094 (91.0)	16601 (90.9)	11530 (87.7)	2500 (83.9)
Single parent	4448 (9.4)	138 (8.7)	896 (8.1)	1480 (8.1)	1486 (11.3)	448 (15.0)
Other	451 (1.0)	13 (0.8)	97 (0.9)	175 (1.0)	134 (1.0)	32 (1.1)
Highest Level of Household Education at age 13 [a], N (%)						
< High School	8544 (18.4)	529 (34.3)	2839 (26.1)	3139 (17.3)	1694 (13.0)	343 (11.6)
High School	16788 (36.0)	433 (28.1)	3702 (34.0)	6767 (37.4)	4870 (37.3)	1016 (34.3)
Some College	8821(18.9)	304 (19.7)	1959 (18.0)	3537 (19.5)	2456 (18.8)	565 (19.1)
≥ Bachelor's degree	12413 (26.7)	275 (17.9)	2383 (21.9)	4669 (25.8)	4044 (31.0)	1042 (35.1)
Family Income Majority of Childhood [b], N (%)						
Poor	3644 (7.8)	207 (13.2)	1054 (9.5)	1478 (8.1)	741 (5.7)	164 (5.5)
Low Income	12231 (26.0)	535 (34.0)	3385 (30.6)	4722 (25.9)	2971 (22.6)	618 (20.8)
Middle Income	28124 (59.9)	734 (46.6)	5944 (53.8)	10948 (60.1)	8534 (65.0)	1964 (66.0)
Well-off	2953 (6.3)	98 (6.2)	672 (6.1)	1073 (5.9)	880 (6.7)	230 (7.7)
Inadequate Food to Eat During Childhood [c], N (%)						
Yes	4275 (9.1)	138 (8.7)	893 (8.1)	1733 (9.5)	1222 (9.3)	289 (9.7)
No	42759 (90.9)	1442 (91.3)	10193 (91.9)	16516 (90.5)	11917 (90.7)	2691 (90.3)
Educational Attainment in Adulthood, N (%)						

Characteristics	Total (N=47,055)	1925–1934 (N=1582)	1935–1944 (N=11087)	1945–1954 (N=18256)	1955–1964 (N=13150)	1965–1974 (N=2980)
< High School	529 (1.1)	25 (1.6)	159 (1.4)	169 (0.9)	134 (1.0)	42 (1.4)
High School	6692 (14.2)	323 (20.4)	1986 (17.9)	2397 (13.1)	1734 (13.2)	252 (8.5)
Some College	9122 (19.4)	336 (21.2)	2253 (20.3)	3515 (19.3)	2561 (19.5)	457 (15.3)
≥ Bachelor's degree	30712 (65.3)	898 (56.8)	6689 (60.3)	12175 (66.7)	8721 (66.3)	2229 (74.8)
Incident Depression After Age 30, N (%)						
Yes	8036 (17.1)	184 (11.6)	1642 (14.8)	3656 (20.0)	2254 (17.1)	300 (10.1)
No	39019 (82.9)	1398 (88.4)	9445 (85.2)	14600 (80.0)	10896 (82.9)	2680 (89.9)
Follow-up (years), mean (± SE)	24.0 (9.9)	41.2 (6.3)	34.0 (6.9)	24.5 (6.1)	16.2 (4.6)	8.9 (2.5)

[a] N=46566

[b] N=46952

[c] N=47034

Table 2.

Association between Childhood Socioeconomic Disadvantage and Incident Clinical Depression Diagnosis After Age 30 among Women in the Sister Study

	Hazard Ratio (95% Confidence Interval)	
	Model 1[a]	**Model 2**[b]
Highest Level of Household Education at Age 13		
≥ Bachelor's degree	1.0	1.0
Some College	0.90 (0.79, 1.03)	0.90 (0.79, 1.02)
High School	0.78 (0.70, 0.87) *	0.78 (0.69, 0.87) *
< High School	0.78 (0.68, 0.90) *	0.78 (0.67, 0.90) *
Some College * time	1.02 (1.00, 1.02)	1.01, 1.00, 1.02)
High School * time	1.02 (1.01, 1.02) *	1.02 (1.01, 1.02) *
< High School * time	1.02 (1.01, 1.03) *	1.02 (1.01, 1.03) *
Rank of Family Income Relative to Others Majority of Childhood		
Well-off	1.0	1.0
Middle Income	0.98 (0.89, 1.08)	0.98 (0.89, 1.07)
Low Income	1.08 (0.98, 1.20)	1.08 (0.98, 1.20)
Poor	1.28 (1.13, 1.44) *	1.28 (1.13, 1.44) *
Report of Not Enough Food to Eat During Anytime in Childhood		
No	1.0	1.0
Yes	1.31 (1.21, 1.41) *	1.31 (1.21, 1.41) *

[a] Model 1 for household educational attainment (N=46566) adjusted for women's race/ethnicity, mother's age at birth, and household composition at age 13. Model 1 for family income the majority of childhood (N=46474) adjusted for women's race/ethnicity, mother's age at birth, household composition at age 13, and highest level of household education at age 13. Model 1 for food insecurity (N=46454) adjusted for women's race/ethnicity, mother's age at birth, household composition at age 13, family income the majority of childhood and highest level of household education at age 13.

[b] Model 2 for all models additionally adjusted for educational attainment in adulthood. All models additionally were also adjusted for calendar year of birth.

* $p < 0.05$.

Table 3.

Association between Childhood Socioeconomic Disadvantage and Incident Clinical Depression Diagnosis After Age 30, Stratified by 10-Year Birth Group, among Women in the Sister Study

	Hazard Ratio (95% Confidence Interval)				
	1925–1934	**1935–1944**	**1945–1954**	**1955–1964**	**1965–1974**
Highest Level of Household Education at Age 13					
≥ Bachelor's degree	1.0	1.0	1.0	1.0	1.0
Some College	0.97 (0.59, 1.60)	0.80 (0.56, 1.16)	0.75 (0.60, 0.95) *	0.97 (0.85, 1.09)	0.97 (0.70, 1.35)
High School	0.94 (0.59, 1.49)	0.66 (0.48, 0.90) *	0.67 (0.54, 0.82) *	0.95 (0.85, 1.05)	0.93 (0.69, 1.23)
< High School	1.16 (0.75, 1.81)	0.46 (0.32, 0.67) *	0.67 (0.51, 0.88) *	1.02 (0.88, 1.18)	1.15 (0.75, 1.75)
Some College * time	--	1.01 (0.99, 1.02)	1.02 (1.01, 1.04) *		--
High School * time	--	1.02 (1.00, 1.03)	1.03 (1.01, 1.04) *		--
< High School * time	--	1.03 (1.01, 1.04) *	1.03 (1.01, 1.04) *		--
Rank of Family Income Relative to Others Majority of Childhood					
Well-off	1.0	1.0	1.0	1.0	1.0
Middle Income	1.12 (0.59, 2.78)	1.04 (0.84, 1.28)	0.92 (0.80, 1.05)	1.12 (0.93, 1.34)	0.67 (0.46, 0.98) *
Low Income	0.95 (0.47, 1.92)	1.07 (0.85, 1.34)	1.02 (0.87, 1.19)	1.34 (1.10, 1.64) *	0.62 (0.39, 0.98) *
Poor	1.28 (0.59, 2.78)	1.23 (0.94, 1.61)	1.18 (0.98, 1.41)	1.58 (1.23, 2.03) *	0.78 (0.42, 1.46)
Report of Not Enough Food to Eat During Anytime in Childhood					
No	1.0	1.0	1.0	1.0	1.0
Yes	1.10 (0.65, 1.84)	1.27 (1.06, 1.52) *	1.30 (1.16, 1.44) *	1.31 (1.13, 1.51) *	1.20 (0.79, 1.84)

[a] Model for household educational attainment adjusted for women's race/ethnicity, mother's age at birth, household composition at age 13, and participant's educational attainment (N=1,541, 10,883, 18,112, 13,064 and 2,966 for models for 10-year birth groups 1925–1934, 1935–1944, 1945–1954, 1955–1964, and 1965–1974, respectively).

[b] Model for family income the majority of childhood adjusted for women's race/ethnicity, mother's age at birth, household composition at age 13, highest level of household education at age 13 and participant's educational attainment (N=1,533, 10,854, 18,083, 13,042,and 2,962 for models for 10-year birth groups 1925–1934, 1935–1944, 1945–1954, 1955–1964, and 1965–1974, respectively).

[c] Model for food insecurity adjusted for women's race/ethnicity, mother's age at birth, household composition at age 13, family income the majority of childhood, highest level of household education at age 13 and participant's educational attainment (N=1,532, 10,853, 18,076, 13,031, and 2,926 for models for 10-year birth groups 1925–1934, 1935–1944, 1945–1954, 1955–1964, and 1965–1974, respectively).

* $p<0.05$