Original Research Article

Childbearing Biographies and Midlife Women's Health

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Abstract

Objectives: We introduce a "childbearing biography" approach to show how multiple childbearing characteristics cluster in ways significant for midlife health.

Methods: We analyze the National Longitudinal Survey of Youth 1979 (NLSY79; *N* = 3992) using mixed-mode Latent Class Analysis with eight childbearing variables (e.g., age at first birth, parity, birth spacing, and mistimed births) to identify how childbearing biographies are associated with midlife health, adjusting for key covariates—including socioeconomic status (SES) and relationship history.

Results: We identify six childbearing biographies: (1) early compressed, (2) staggered, (3) extended high parity, (4) later, (5) married planned, and (6) childfree. Childbearing biographies are strongly associated with physical health but not mental health, with differences primarily explained by SES.

Discussion: Different childbearing biographies are related to physical health inequalities above what is demonstrated by the typical use of one or two childbearing measures, providing a new perspective into the growing health gap among aging midlife women.

Keywords

childbearing, motherhood, midlife health, latent class analysis

Childbearing is strongly associated with health across the life course, including at midlife, and the links between childbearing and aging women's health are seen with several childbearing measures (age at first and last birth, parity, nonmarital births, fertility expectations, spacing of births, unwanted, and mistimed births; Holton et al., 2010; Spence, 2008; Williams et al., 2015). However, studies investigating whether and to what degree childbearing is associated with midlife health typically look at only one childbearing measure, or at best two childbearing measures concurrently. Social scientists have called for a more integrative approach to analyzing multiple childbearing components across the life course to better understand associations between complex childbearing patterns and midlife health (Grundy & Read, 2015; Johnson et al., 2018). Supporting the positive potential of a more comprehensive approach, studies analyzing more than one childbearing measure together—most commonly age at first birth and marital status at first birth—have found important intersections of these constructs, for example, finding the lowest morbidity risk among married women who had children in their 20s and 30s (Williams & Finch, 2019).

To continue to refine prior understandings of childbearing and health at midlife, we develop the concept of childbearing biographies, which emphasizes that midlife health is shaped by multiple co-occurring and cascading childbearing characteristics. Considering multiple childbearing components together and comparing these profiles to childfree women is a necessary step towards developing a more complete picture of the implications of childbearing for women's health at midlife and beyond. Additionally, given that childbearing and midlife health are each associated with socioeconomic status (SES) and relationship histories (Henretta, 2007; Nomaguchi & Milkie, 2020), it is important to incorporate these additional contexts into a consideration of how childbearing matters for health among aging women. Doing so allows us to understand whether it is childbearing biographies that matter for midlife health directly, or whether SES and relationship histories help account for these associations. To build and test our model of childbearing biographies and

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health, we analyze survey data from the National Longitudinal Survey of Youth 1979 (NLSY79), which includes nearly four decades of detailed data and comprehensive measures assessing childbearing characteristics, health, and other relevant variables across multiple time points. Our study demonstrates both the method and the usefulness of the childbearing biography approach for understanding aging and health, providing new insight into distributions of childbearing patterns and their associations with midlife health beyond what was previously demonstrated using one or two childbearing indicators.

Childbearing Characteristics Associated with Midlife Health

Numerous studies show how separate aspects of childbearing are associated with health in midlife (see Nomaguchi & Milkie, 2020 for overview), although the direction of these associations is unclear. Some studies show women with any previous births have similar or even worse health compared to childfree women, but other studies find mothers have better health and even lower mortality risk than the childfree (Hank & Wagner, 2013; Henretta et al., 2008; Holton et al., 2010; Zeng et al., 2016). Parenting children is stressful and strains resources, potentially damaging well-being into midlife and beyond (Pudrovska, 2009), but not having children is stigmatized within US culture in ways that may be negatively associated with long-term health (McQuillan et al., 2012). Further, in midlife in particular, women with children may benefit from social support from their older children (van den Broek, 2020). Given these disparate pathways and the need to approach childbearing patterns holistically, it is reasonable that there is no consensus within the literature regarding how childbearing status is associated with midlife health.

In addition to childbearing status (i.e., whether a person has given birth), the childbearing variables most studied in relation to midlife health are age at first birth, number of births (i.e., parity), and nonmarital births. Studies considering age at first birth typically consider the detrimental long-term health correlation with adolescent births. Compared to women with later first births, women with teen births have more midlife health issues and even higher risks of early mortality, likely partially due to educational attainment disruptions, fewer resources, and the stigma of teen motherhood (Henretta, 2007; Mollborn & Morningstar, 2009; Patel & Sen, 2012). Yet, there is also some evidence that older ages at first births, especially if later than initially planned, are associated with poor mental health at midlife (Carlson, 2011). Regarding number of births, some studies find a nonlinear pattern such that women with medium parity (2–3 childbirths) have better health than women with one child or four or more children (Högnäs et al., 2017; Keenan & Grundy, 2019; O'Flaherty et al., 2016; Zeng et al., 2016). Worse health with high parity may be due to the added stress associated with each childbirth and caring for each child. In contrast, some research concludes that more childbirths are associated with worse health at older ages, perhaps due to the social support provided by adult children at these ages (van den Broek, 2020). Studies focusing on nonmarital births are more straightforward, finding that these births are associated with worse health in midlife (Keenan & Grundy, 2019; Koropeckyj-Cox et al., 2007; Williams et al., 2011).

Age at first birth, parity, and nonmarital births have been studied a great deal, but other components of childbearing might also be correlated with midlife health. Age at last birth is typically studied in relation to very specific health outcomes (e.g., cancer risk; Setiawan et al., 2012; Wu et al., 2019), and thus the overall health impact of this childbearing characteristic is unknown. A later age at last birth also designates women who are still experiencing pregnancy and childbirth into midlife (e.g., 40s) (Carlson & Guzzo, 2021), contributing to potentially different midlife health experiences compared to women whose last births were earlier in adulthood. There is limited evidence suggesting that fertility expectations, spacing of births, and unplanned births (including unwanted and mistimed births) are associated with women's midlife health. Studies examining fertility expectations find that meeting these expectations is often associated with better health than not meeting them, with most of these studies considering childbirth timing and relationship context (e.g., whether expect to be married when give birth) and early adulthood mental health (Carlson & Williams, 2011D. L. Carlson & Williams, 2011; Rackin & Brasher, 2016). Regarding birth spacing, a Norwegian study found increased mortality risk in mid- and later-life among women with shorter interbirth intervals, suggesting adverse long-term implications for women with closely spaced births (Grundy & Kravdal, 2014). Finally, a US study determined that women with at least one unwanted birth had significantly more depressive symptoms in their 50s but no associations were found between mistimed births and mental health (Herd et al., 2016).

Taken together, consensus has not been reached on how childbearing characteristics are associated with health at midlife, nor has past work developed a clear approach to managing multiple childbearing variables together in one study to test these associations.

The Importance of a Childbearing Biography Perspective

Demographic research demonstrates that various childbearing characteristics cluster together, likely with midlife health implications. For example, older ages of first birth are linked to fewer children (Tomkinson, 2019). Because of this overlapping, too much attention to any single childbearing characteristic may mask other aspects of childbearing that are interrelated and possibly important for midlife health. Fertility histories and reproductive career approaches emphasize the need for a more multi-faceted approach to understanding

childbearing experiences (Gemmill, 2019; Grundy & Read, 2015; Johnson et al., 2018). Yet current approaches are typically limited to looking at only two or three childbearing components (e.g., number and spacing of children, age at each birth), or articulating a theoretical framework that has not been empirically tested—especially as it relates to the long-term associations between childbearing and health. Other studies examine two childbearing components together using interactions (Spence & Eberstein, 2009; Williams & Finch, 2019), finding, for example, that births in adolescence are associated with midlife depression but only when those births are unplanned (Rackin & Brasher, 2016). To further develop our childbearing biography approach, we use a novel methodological approach, discussed in more detail below, in order to emphasize how multiple childbearing components form distinct childbearing biographies. Our approach using latent class analysis is similar to previous studies of family and life course processes—for example, Tosi and Grundy's (2021) examination of work-family life courses (e.g., number of children, working duration) and Engels and colleagues' (2019) study of childbearing and work patterns. In our specific approach, we focus on multiple aspects of childbearing, drawing attention to how distinct childbearing biographies are linked to midlife health—a useful innovation to understand health disparities at midlife and later ages.

Socioeconomic Status and Relationship Histories as Additional Important Contexts in the Childbearing Biography Approach

Childbearing biographies are not independent predictors of midlife health, but closely tied to other sociodemographic components—such as SES and relationship history—which in turn are important for midlife health (Spence, 2008). SES likely matters for understanding the childbearing biography and midlife health association in two ways. First, SES is a selection factor, shaping women's childbearing experiences and health through potentially independent pathways. For example, women from low SES backgrounds are more likely to have both adolescent childbirths and poor health at midlife (Gorry, 2019). Second, SES is a possible mediator between women's childbearing and their midlife health, such that women who have certain childbearing experiences (e.g., children in adolescence, nonmarital births) will likely face disruptions to their educational and economic pursuits with consequences for their midlife health and well-being (Diaz & Fiel, 2016).

Regarding relationship history, prior studies emphasize the interconnections between childbearing and intimate relationship trajectories, termed the family life course (Kravdal et al., 2012; O'Flaherty et al., 2016). This highlights the importance of examining relationship history and childbearing history in tandem. For example, relationship histories are associated with certain childbearing experiences (e.g., never married women more likely to be childfree), and these relationship histories are important for midlife health (Hughes & Waite, 2009). A holistic view of how relationship history might matter when examining associations between childbearing and midlife health goes beyond identifying the impact of nonmarital births. In sum, we propose that SES and relationship history should be considered when estimating the association between childbearing biographies and midlife health. Additionally, earlier life circumstances—such as parental education and early adulthood health—may help drive the associations between childbearing and midlife health, selecting women into specific childbearing patterns and health outcomes, and we take care to adjust for these variables when estimating childbearing and health relationships.

Methods

We analyze the National Longitudinal Survey of Youth 1979 (NLSY79), a longitudinal and nationally representative cohort study from the US (Rothstein et al., 2018). Our primary sample includes the 3992 women who completed the 50s Health Module. At baseline, the NLSY79 was composed of 6283 women, including oversamples of Hispanics, people socioeconomically-disadvantaged non-Black and non-Hispanic people, and adults in the military (n=1331). These oversamples were discontinued in later years, and thus excluded from our analysis because they did not provide complete childbearing or midlife health information. We also exclude the 960 women who did not complete the 50s Health Module due to attrition prior to age 50 (Aughinbaugh et al., 2017). Respondents who did not complete the 50s Health Module were less likely to have children than other respondents, suggesting our results regarding the childfree women may be less representative of the general childfree population than our results of women with children.

Measures

Childbearing Biography Measures. Childbearing measures in the NLSY79 include childbearing events that took place before the start of the survey in 1979 and between survey waves (1979–2018). Based on existing research reviewed above, we construct eight childbearing biography variables: age at first birth, age at last birth (with this equal to age at first birth if one child), number of live births, whether unmarried at any birth, whether had more total children than had expected in 1979, whether any births within a 2-year period (i.e., 23 months or less), whether any births were "unwanted" at time of birth, and whether any births were "mistimed." The first three variables are treated as continuous, and the latter five dichotomous. For unwanted and mistimed births, respondents were asked regarding each pregnancy if wanted to be pregnant. We categorize "No, not at all" as an "unwanted" pregnancy and "No, not at that time" as a "mistimed"

pregnancy (Guzzo, 2021). We tested models including additional measures, such as whether any pregnancy losses, whether any abortions, whether had a multiple birth, and whether more children than desired. These are not included in final models because did not improve model fit statistics or too correlated with existing variables.

Health Measures. The NLSY79 uses the SF-12 at age 50 to evaluate physical and mental health, a 12-question health survey designed to provide a measure of respondents' health regardless of whether they use formal health care services (Vilagut et al., 2013; Ware & Kosinski, 2001). The SF-12 provides two outcome variables: a continuously measured mental health percentile (MCS) and a continuously measured physical health percentile (PCS). PCS is based on questions about physical functioning, limitations due to physical problems, physical pain, and general health perceptions. MCS is based on questions assessing if, due to emotional problems, the respondent accomplished less than they would like or did work less carefully than usual; how much of the time the respondent felt calm and peaceful, had a lot of energy, or felt down; and if emotional problems interfered with social activities. Scores range from 0.00 to 100.00, with scores higher than 50 indicating that a respondent's mental or physical health is above average relative to a typical US adult. Within our sample at age 50, MCS is 51.86 and PCS is 48.93. Previous research using the SF-12 measures finds significant associations between childbearing characteristics and health (Frech & Damaske, 2012; Patel & Sen, 2012).

Socioeconomic Status. SES variables include own educational attainment, employment status at age 50, and whether family income is below the poverty line at age 50. Own educational attainment has four categories: 0–11 years of education, 12 years, 13–15 years, and 16 or more years. Employment status includes three categories: no paid employment, part-time employment (less than 40 hours per week), and full-time employment (40 hours or more per week). We use a measure constructed by the NLSY79 based on reported total net family income, family poverty status, categorizing respondents as "not in poverty" or "in poverty" at age 50. Using a measure of family income, rather than the poverty measure, provides similar results.

Relationship History. We adjust both for relationship status at 50 (single, cohabiting, or married) and whether ever married. In doing so, we are able to account for both a life course measure of ever married and current relationship status at the time of the health outcomes, both of which are shown to be independently associated with midlife health (Hughes & Waite, 2009).

Other Covariates. All models adjust for race/ethnicity, birth year (1957–1964), whether live in rural location at age 50, health limitations at age 20, and parental educational attainment (i.e., at least one parent has 12 or more years of education), because each has been shown in previous research to be associated with childbearing and midlife health and are possible confounders (Nomaguchi & Milkie, 2020). Race/ethnicity includes Non-Hispanic White (hereafter White), non-Hispanic Black (hereafter Black), Hispanic, and Other Race (e.g., Asian, Native American, and multiracial respondents). For health limitations at age 20, all respondents, regardless of labor force status, were asked about health limitations at every wave; we code respondents who report at least one health problem that inhibits their ability to work or limits the amount or kind of work as having health limitations.

Analytic Strategy

We first calculate descriptive statistics of all variables, then analyze whether the childbearing variables are associated independently with health at age 50, using the SF-12 indices (MCS and PCS). We next use Mixed-Mode Latent Class Analysis (MM-LCA), a useful method for uncovering and describing contextual patterns and complex intersections among covarying measures (Muthén, 2002). We conduct MM-LCA on the 3370 women with children in the sample. Latent Class Analysis (LCA) is a person-centered approach that presupposes that responses to a set of observed variables (e.g., childbearing variables) are indicative of an underlying latent variable with a finite number of mutually exclusive classes or subtypes (e.g., childbearing biographies; Collins & Lanza, 2010). LCA allows for the identification of homogeneous subpopulations (e.g., women with similar childbearing biographies) within the larger heterogeneous population (e.g., mothers; Vermunt & Magidson, 2004). With LCA, each case is grouped into only one class, k, but each case is also given a probability value of belonging to each of the k groups, and these probability values can be interpreted to represent the prevalence of each class (Morgan, 2015). MM-LCA allows for the use of discrete and continuous data with various parametric distributions, using multiple data types as indicators to put similar objects into groups (Sammel et al., 1997). To assess whether one data type dominates the structure of the latent class models, we evaluate the expected posterior gradient (EPG), which measures the absolute contribution of a variable to MM-LCA, and do not find evidence of this issue (Zhang & Ip, 2014).

For MM-LCA, first, we estimate our latent class model using only the latent class indicator variables. We identify the optimum number of classes based on model fit statistics, specifically Bayesian information criterion (BIC), sample size-adjusted Bayesian information criterion (SSBIC), Akaike information criterion (AIC), the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR), and the parametric bootstrapped likelihood ratio test (PBLRT) (Jung & Wickrama, 2008; Morgan, 2015). Table 1 shows the model fit statistics for each estimated model (1-10 classes). We graph

Table 1. Fit Statistics: Childbearing Biographies (National Longitudinal Survey of Youth 1979; *N* = 3370).

Number of Classes	Entropy	AIC[a]	BIC[b]	SSA-BIC[c]	VLMR LRT (*p*)[d]	PBLRT (*p*)[e]
1		75,163.06	75,230.41	75,195.46		
2	0.797	72,203.98	72,326.43	72,262.88	<.001	<.001
3	0.783	70,169.90	70,347.46	70,255.31	<.001	<.001
4	0.795	69,453.61	69,686.27	69,565.52	<.001	<.001
5	0.811	68,786.95	69,074.71	68,925.37	0.126	<.001
6	0.797	68,322.72	68,665.59	68,487.65	0.003	<.001
7	0.804	68,019.51	68,417.48	68,210.95	0.154	<.001
8	0.826	67,565.99	68,019.07	67,783.93	0.024	<.001
9	0.828	67,283.16	67,791.34	67,527.62	0.105	<.001
10	0.841	67,118.14	67,681.43	67,389.10	0.056	<.001

[a]Akaike information criterion.
[b]Bayesian information criterion.
[c]Sample size-adjusted Bayesian information criterion.
[d]Vuong-Lo-Mendell-Rubin likelihood ratio test.
[e]Parametric bootstrapped likelihood ratio test.

Table 2. Item-Response Probability and Means/Standard Deviations for Childbearing Biography Indicators Used in Latent Class Analysis and Expected Sample Size (National Longitudinal Survey of Youth 1979; *N* = 3370).

	Early Compressed Childbearing	Staggered Childbearing	Extended High Parity Childbearing	Later Childbearing	Married Planned Childbearing
Expected *n*	953	907	120	356	1034
Age at first birth	19.38 (0.18)	19.54 (0.20)	18.52 (0.76)	34.36 (0.53)	26.56 (0.36)
Age at last birth	22.98 (0.32)	29.59 (0.57)	33.26 (1.09)	36.56 (0.39)	30.64 (0.36)
Number of children	1.87 (0.07)	3.39 (0.19)	6.06 (0.04)	1.70 (0.07)	2.02 (0.04)
Unmarried any child	0.57	0.69	0.77	0.23	0.17
More children than expected in 1979	0.12	0.72	0.93	0.16	0.18
Less than 2 years between any births	0.16	0.54	0.94	0.19	0.17
Any unwanted births	0.21	0.40	0.52	0.12	0.07
Any mistimed births	0.57	0.74	0.77	0.17	0.30

AIC, SSBIC, and BIC and identify that the points of "diminishing returns" are at the 3-, 5-, and 6-class models. The VLMR LRT and the PBLRT provide a *p*-value comparing a *k*-1 class model to a *k* class model with a statistically significant *p*-value providing evidence for the *k*-1 class model. The PBLRT has $p < .001$ in all test models, and the 2-, 3-, and 4 and -class models have $p < .001$ for the VLMR LRT. We suggest that these different fit statistics collectively provide evidence in support of the 4-class, 5-class, or 6-class model. For these three models, we estimate the probabilistic assignment of each respondent to each class (e.g., childbearing biography) based on the posterior probabilities estimated in the first step, and create the most likely class variable (i.e., the childbearing biography to which a respondent most likely belongs) using these latent class posterior distributions. We show the item-response probabilities for the binary variables and the mean estimates for the continuous variables used in construction of the childbearing biographies for the 4-class model in Supplemental Table A, the 5-class model in Table 2, and the 6-class model in Supplemental Table B. We suggest, compared to the 4-class models, that the 5- and 6-class models better reflect the diversity of childbearing experiences among the current cohort of midlife women that emerged during the Second Demographic Transition (Lesthaeghe, 2010). For the 5- and 6-class models, considering the meanings of the classes, parsimony, and class size provides the strongest support for the 5-class model, given significant overlap in childbearing variables between two of the classes in the 6-class model. Further supporting this conclusion, entropy values greater than 0.80 suggest "good" classification of individual cases into classes (Clark & Muthén, 2009), and the entropy for the 5-class model is above 0.80, whereas the 6-class model is below.

Building on the 5-class model, we construct an additional class of "childfree," assigning respondents a 1.00 probability of belonging to that class if had no children and a 0.00

Table 3. Descriptive Statistics; Mean (Standard Deviation), or Proportion (National Longitudinal Survey of Youth 1979; $N = 3992$).

Any Children	0.83
Age at first birth+	24.14 (0.12)
Age at last birth+	29.34 (0.12)
Number of children+	1.96 (0.02)
Unmarried any child+	0.33
More children than expected in 1979+	0.29
Less than 2 years between any births+	0.27
Any unwanted births+	0.17
Any mistimed births+	0.45
SF-12 (physical) at age 50	48.93 (0.20)
SF-12 (mental) at age 50	51.86 (0.18)
Race/Ethnicity	
Non-Hispanic White	0.74
Non-Hispanic Black	0.15
Hispanic	0.07
Other race/ethnicity	0.04
Birth year	1960.41 (0.04)
Rural residence at age 50	0.26
Health limitations at age 20	0.05
At least one parent 12 or more years of education	0.75
Years of education	
0–11 years	0.07
12 years	0.41
13–15 years	0.26
16 or more years	0.26
Employment status at age 50	
No paid employment	0.22
Part-time paid employment	0.11
Full-time paid employment	0.67
Family income below poverty line at age 50	0.13
Relationship status at age 50	
Single	0.28
Cohabiting	0.04
Married	0.68
Ever married	0.91

Note. Weighted using sample weights. + If at least one childbirth, $N = 3370$.

probability if had children, creating in total six childbearing biographies. Finally, we analyze the association between childbearing biographies and SF-12 indices, first estimating means and standard errors then using multivariate linear regression, regressing SF-12 at age 50 on the most likely class variable (which we call childbearing biographies) and adjusting for covariates. Our first model adjusts for race/ethnicity, birth year, rural residence, health limitations at age 20, and parental education, and subsequent models include SES measures and relationship history.

Because we assign respondents to a single class based on their posterior probability, there is a concern about uncertainty of class membership biasing our results. To assess this, we conducted supplementary analysis using the three-step method for latent class predictor variables (using the R3STEP command in MPlus; Asparouhov & Muthén, 2014; Vermunt, 2010). The results are similar to what we present below, with small differences in p values that do not change substantive conclusions. Thus, although we still recognize the potential for classification error to impact the interpretation of results, given similarities of findings as well as an entropy level >.80 (see Table 1), classification error does not appear to be a major concern for our analysis. All analyses are conducted in Stata and MPlus, and models use weights constructed by the NLSY.

Results

Table 3 shows the weighted descriptive statistics for childbearing biography measures, health outcomes, and other covariates. Eighty-three percent of the sample had at least one live birth. Within this group, the mean age at first birth was 24.14 years and last birth 29.34, respondents had on average 1.96 children, and about one third of respondents were unmarried for any births, slightly less than 30% had less than 2 years between any births and more children than they had expected in 1979, 17% had any unwanted birth, and 45% had any mistimed births. Table 4 indicates how each of these same childbearing biography variables are associated with SF-12 at age 50. Four of the variables are significantly associated ($p <$ .05) with both physical and mental health at age 50—namely, those with earlier first births, married for all childbirths, with no unwanted births, and with no mistimed births have better physical and mental health than their counterparts. Three variables—having any children, having more children, and less than 2 years between any births—are not significantly associated with physical or mental health. Notably, this indicates that there is no significant difference in health outcomes for childfree women compared to women with children at this aggregate level.

We turn next to the childbearing biographies, shown above in Table 2, named in accordance with the most salient and distinguishing characteristics of each group. Both the "married planned" childbearing biography (26% of the full sample which includes childfree women) and the "later" biography (9%) are characterized by mid-20s–30s childbearing, less likely to be unmarried at any birth than other biographies, low rates of childbirths spaced within 2 years, mostly not having more children than expected, and rarely having any unwanted or mistimed births. As a key distinction, the "later" biography has an older age of first and last birth (both in mid-30s), fewer children (mean: 1.70, compared to 2.02 for "married planned"), and a lower rate of mistimed births. The "early compressed" biography (23%) is similar to the "later" biography in having a fairly short period of childbearing, less than two children on average, and low rates of having more children than expected, childbirths spaced within 2 years, and any unwanted births. But the "early compressed" biography is also characterized by an earlier age of first and last birth (mean: 19.38 and 22.98 years,

Table 4. Mean and Standard Error of SF-12 (Physical and Mental Health) at Age 50 (National Longitudinal Survey of Youth 1979) by Childbearing Characteristics and Biographies.

	SF-12 Physical Health		SF-12 Mental Health	
N = 3370	Mean (SE)	*p*	Mean (SE)	*p*
No children[+×]	49.01 (0.49)	.855	51.90 (0.46)	.931
Has any children[+×]	48.91 (0.22)		51.85 (0.19)	
Age at first birth younger than 20	46.32 (0.46)	.000	51.09 (0.39)	.026
Age at first birth 20 or older	49.62 (0.22)		52.06 (0.20)	
Age at last birth less than 35	48.44 (0.25)	.000	51.75 (0.22)	.368
Age at last birth more than 35	49.88 (0.33)		52.08 (0.30)	
Number of children three or fewer	49.05 (0.24)	.090	51.88 (0.21)	.725
Number of children more than three	47.97 (0.59)		51.69 (0.50)	
Unmarried any child	46.19 (0.38)	.000	50.74 (0.34)	.000
Married for all children	50.29 (0.26)		52.42 (0.23)	
Same or fewer children than expected in 1979	49.48 (0.26)	.000	51.88 (0.23)	.834
More children than expected in 1979	47.51 (0.43)		51.79 (0.35)	
Less than 2 years between any births	49.10 (0.26)	.161	51.87 (0.23)	.882
Two or more years between all births	48.41 (0.41)		51.81 (0.35)	
No unwanted births	49.16 (0.24)	.011	52.06 (0.21)	.019
Any unwanted births	47.72 (0.51)		50.87 (0.46)	
No mistimed births	50.00 (0.29)	.000	52.72 (0.24)	.000
Any mistimed births	47.60 (0.34)		50.81 (0.31)	
N = 3992	Mean (SE)	*p* (compared to childfree)	Mean (SE)	*p* (compared to childfree)
Childfree	49.01 (0.49)		51.90 (0.46)	
Early compressed	46.45 (0.48)	.000	50.79 (0.42)	.075
Staggered	47.45 (0.46)	.021	51.76 (0.40)	.825
Extended high parity	46.63 (1.21)	.069	50.86 (1.01)	.350
Later	51.86 (0.47)	.000	52.20 (0.50)	.659
Married planned	50.64 (0.35)	.007	52.59 (0.30)	.205

Note. Weighted using sample weights. [×]*N* = 3992; SE = Standard error.

respectively), and over half of women in this biography are unmarried for at least one birth and have a birth they characterized as mistimed. The remaining two childbearing biographies, "staggered" and "extended high parity," have an early age at first birth (19.54 and 18.52 years, respectively), similar to "early compressed." Both also have the highest rates of any nonmarital births, more children than expected, less than 2 years between births, any unwanted births, and any mistimed births. The "extended high parity" biography (about 3% of full sample) has the highest rates of each of these indicators. The "extended high parity" biography also has the most children (mean: 6.06) and the longest period of childbearing (mean: 14.74 years). The "staggered" biography (about 24%) has almost half as many children on average as the "extended high parity" biography (mean: 3.39) and a younger mean age of last birth (about 30 years).

We then estimate associations between the childbearing biographies—adding the "childfree" biography category—and physical and mental health at age 50. Coefficients from regression analyses are shown in Supplemental Tables C (Physical Health) and E (Mental Health), with the predicted value of the SF-12 for each childbearing biography shown in Figure 1 and Supplemental Tables D and F. Turning first to the association between childbearing biographies and physical health (Models 1a-4a), we find in the baseline model (1a) that, compared to the childfree respondents, "early compressed" childbearing biography respondents have worse physical health and "later" and "married planned" childbearing biography respondents have better health, with the best health among "later" childbearing biography respondents. There is no significant difference in physical health for "childfree" respondents compared to respondents with "staggered" or "extended high parity" childbearing biographies. The predicted values, shown in Figure 1 (1a), allow further comparison across groups, and indicate that "early compressed," "staggered," and "extended high parity" biography respondents have significantly worse physical health than "later" and "married planned" childbearing biography respondents. There are no statistically significant differences to report between "early compressed," "staggered," and "extended high parity."

Next, we adjust for two categories of covariates: SES (Model 2) and relationship history (Model 3); we include all

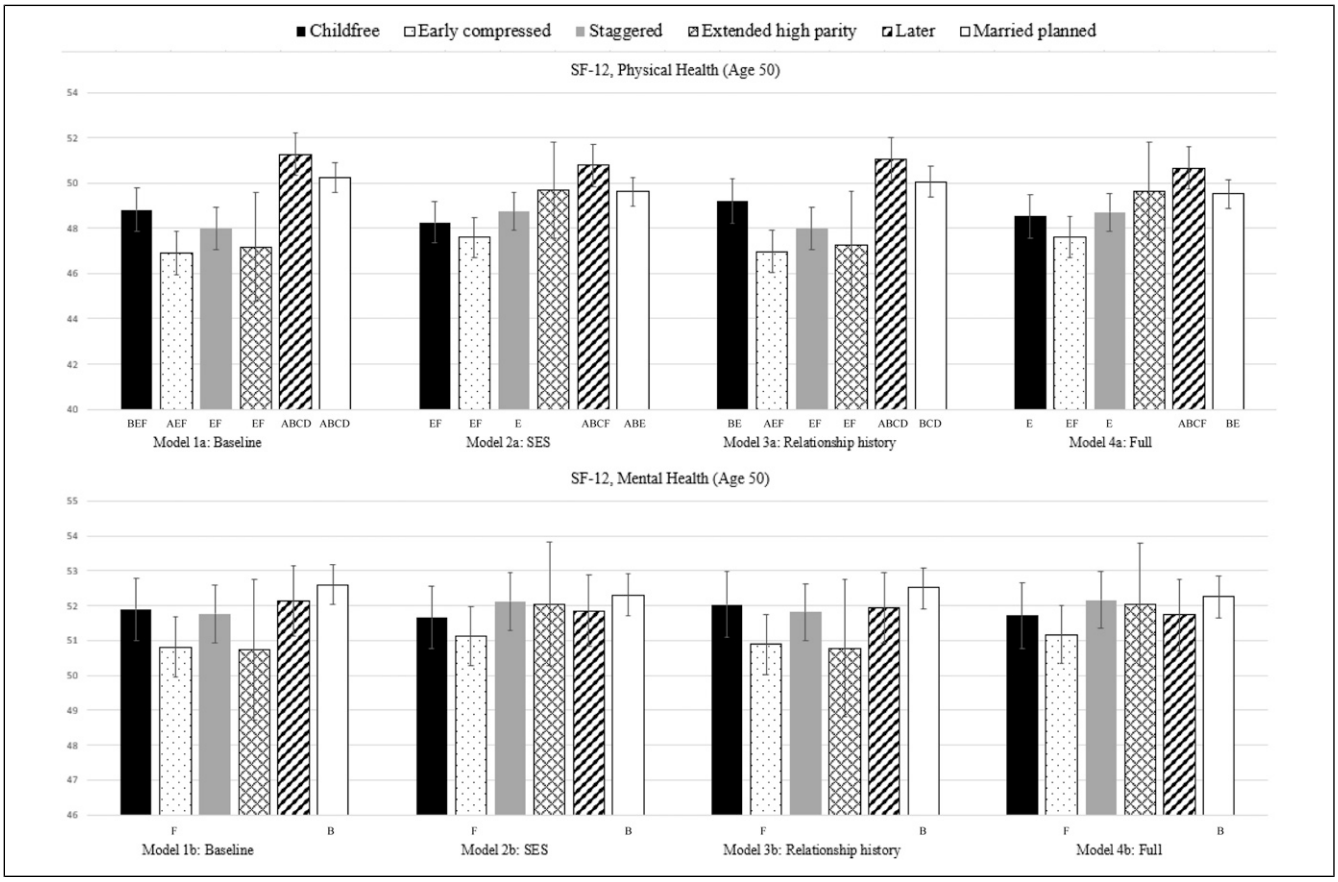

Figure 1. Predicted Values of SF-12, Physical and Mental Health, at Age 50 by Childbearing Biographies (NLSY79). Weighted using sample weights. Post-estimation values calculated using parameter estimates from linear regression models, holding covariates at their means. Regression models shown in Supplemental Table C and E. Significantly different ($p < .05$) from [A]childfree, [B]early compressed, [C]staggered, [D]extended high parity, [E]later, [F]married planned. N=3992.

covariates in Model 4. SES is the most important in accounting for childbearing biography differences in physical health. After adjusting for SES (2a), there are no longer statistically significant differences (at the $p < .05$ level) between the physical health of those who are childfree and those with "early compressed" childbearing biographies, nor are there significant differences between those with "extended high parity" biographies and those with "later" or "married planned" biographies. Yet the physical health advantage for those with "later" and "married planned" childbearing biographies compared to childfree and those with "early compressed" childbearing biographies remain significant, as does the health difference between "staggered" and "later" biography respondents. There is now also a physical health advantage for "later" childbearing biography respondents relative to "married planned" childbearing respondents. Relationship history covariates (3a) have less explanatory power than SES, and most significant associations between childbearing biographies and physical health from baseline remain once relationship covariates are included, although the health advantage of "married planned" relative to childfree respondents disappears in these models. After including all covariates in the model (4a), the only persistent physical health finding is the advantage for "later" childbearing biography respondents, who still report better physical health compared to childfree, "early compressed," "staggered," and "married planned" respondents, and for "married planned" respondents who report better health than "early compressed" respondents.

With mental health (Models 1b–4b), there are no statistically significant differences ($p < .05$) between the childfree respondents and the other childbearing biographies, although the predicted value comparisons demonstrate that, in the baseline model, "married planned" respondents report significantly better mental health than "early compressed" respondents (see Model 1b in Figure 1 and Supplemental Tables E and F). After adjusting for SES and relationship history covariates (Models 2b, 3b, and 4b), this advantage for "married planned" respondents' mental health relative to "early compressed" respondents remains. In general, however, childbearing biographies are not associated with mental health across models.

Discussion

The patterns of if, when, and under what contexts people have children has implications for understanding midlife health

disparities. Past work has typically focused only on how one or two dimensions of how childbearing shapes health into midlife, but this research misses how multiple aspects of childbearing have the potential to shape health as a person, and in the case of this study a woman, ages. In the present study, we use a novel approach to identify six classes of childbearing biographies, one class of which are childfree women, to demonstrate how different childbearing biographies are associated with midlife health. Our findings show that childbearing patterns matter for midlife physical health but not generally mental health, suggesting that associations between childbearing and physical health extend beyond the immediate timeline after giving birth or raising young children—spanning into midlife and likely into later life in potentially compounding ways. Most notably, we find that women with the early compressed childbearing biography have the worst physical health, and women with the later childbearing biography have the best physical health. However, after adjusting for SES and relationship history, which we theorize are key factors in helping understand these associations, only the later childbearing group has better health on average than other childbearing biographies. In contrast, there are limited differences in mental health outcomes across childbearing biographies. Our findings and approach have the potential to provide insight into the causes of the growing disparities in mid- and later-life physical health that have developed over recent decades (Montez & Zajacova, 2013). Key findings and implications are discussed below.

First, our main findings suggest that women with the early compressed childbearing biography have the worst physical health, and women with the later childbearing biography the best. On the one hand, these two groups have much in common that, in isolation, would make their divergence in health at midlife surprising. Namely, both groups have a fairly short period of childbearing, less than two children on average, and low rates of having more children than expected, childbirths spaced within 2 years, and any unwanted births. But on the other hand, there are also points of departure in their profiles that appear to have major implications for health later in life—for example, women with early compressed biographies typically have adolescent births, nonmarital births, and mistimed births, which previous research shows is associated with worse midlife health, on average (Herd et al., 2016; Williams et al., 2011). Consideration of any of these childbearing characteristics in isolation would miss the patterned way in which these characteristics cluster, forming distinct profiles identified by our MM-LCA approach. By including multiple components of childbearing within the childbearing biography construct, we chart how seemingly distinct aspects of childbearing cluster together, finding that it is the collective biography that matters for physical health, instead of or in addition to any one childbearing variable (e.g., age at first birth, number of children). The childbearing biography approach that we deploy—and that builds on prior work regarding fertility histories and reproductive careers (Grundy & Read, 2015; Johnson et al., 2018)—deemphasizes individual indicators of childbearing to highlight how these indicators group to form distinct sets of childbearing experiences within the population, with consequences for midlife health.

Our childbearing biography approach to understand midlife health disparities also extends prior concepts such as fertility histories and reproductive careers by taking a "long-arm" approach (Hayward & Gorman, 2004), recognizing that the impact of childbearing extends well-beyond the childbearing years. Of note, we find significant midlife health patterns only with physical health, echoing previous studies that find long-term consequences of family statuses and transitions are most pronounced for physical health at midlife and short-term consequences more salient for mental health (Hughes & Waite, 2009; Lorenz et al., 2006). Our evidence for physical health associations with childbearing biographies (but less so mental health) is consistent with a study analyzing the NLSY79 that found women who had children in adolescence had worse physical health at midlife, but the association between adolescent childbearing and mental health was less robust (Patel & Sen, 2012). Given these previous studies, it is possible that if we had considered health in women's 20s and 30s, we may have found a significant association between childbearing biographies and mental health, but that these associations perhaps dissipate over time. Our different findings regarding physical and mental health suggest heterogeneous pathways connecting early childbearing experiences to midlife physical and mental health, an important site for future life course research.

Second, childfree women have better physical health at midlife than early compressed childbearing biography respondents, but worse physical health than later and married planned biographies. By including childfree women as a comparison group within our childbearing biographies alongside different groups of women who have given birth, our findings demonstrate the value in differentiating *between* groups of mothers—not just *all* mothers—in comparison to childfree women when studying health outcomes. Our findings provide new insight into why past research comparing the health of women with children to women without children at midlife found mixed results (Hank & Wagner, 2013; Henretta et al., 2008; Holton et al., 2010). As studies have repeatedly demonstrated, it is not the presence or absence of children that matters, but the broader context of childbearing and childrearing that impacts health outcomes (Glass et al., 2016; Myrskylä et al., 2017). We argue that one way to identify this broader context and diversity of childbearing is through incorporating multiple measures of childbearing in the analysis, highlighting diversity within the "mother" category. Previous studies of childbearing and health often exclude childfree women, but this limits conclusions that can be drawn about how and under what circumstances childbearing (or not) matters for health. We suggest that future studies investigate additional variables to

construct childfree biographies, recognizing the heterogeneity within this group and the complexity of the childfree trajectory (Gemmill, 2019; McQuillan et al., 2012).

Third, we also test some mechanisms that may explain our findings: socioeconomic status and relationship history. We find that these factors are indeed critical in understanding the association between childbearing biographies and health, as most significant findings are explained by SES (and to a lesser extent relationship history). However, even after adjusting for SES and relationship history, the later childbearing group still has better physical health on average than most other childbearing biographies; this finding is line with other research showing health advantages of later motherhood potentially outweigh any negative effects of childbearing during later reproductive aging periods (Myrskylä et al., 2017). By adjusting for SES and relationship history—as well as for possible confounders (e.g., parental education, health limitations at age 20), we recognize the role each of these sets of variables plays in both selecting people into specific childbearing biographies and midlife health profiles and providing a mechanism connecting childbearing biographies and midlife health, suggesting selection and causal pathways likely work in tandem across the life course.

Our findings suggest that childbearing biography matters but, in line with other studies (Grundy & Read, 2015; Spence, 2008) and in partial support of fundamental cause theory (Phelan et al., 2010), these associations are largely due to childbearing's relationship to SES, Most of the significant physical health disadvantage among women with early compressed and staggered biographies being explained by SES suggests that it is not necessarily that the experience of the early compressed or staggered biographies causes direct negative health effects, but rather this childbearing biography is connected to SES which in turn is related to health. For example, it may be that the later childbearing biography allows for women to have more educational attainment and a higher paying job, as suggested in Tosi and Grundy's recent study (2021). At the same time, there are a number of selection factors associated with childbearing biographies and midlife health, such as childhood health or lifestyle factors, that we do not fully account for but likely matter for understanding the observed patterns in this study, leading us to caution against an overly causal explanation given our analytic limitations. Future research should continue to examine the multiple co-occurring and cascading life course mechanisms contributing to the health advantage of later childbearing biography respondents—and to a lesser extent, married planned respondents.

Limitations

Findings should be interpreted in light of several limitations. First, the data reflect the current population of midlife women in the US today, only generalizable to this specific population. We are not able to compare this current cohort of midlife women to prior cohorts, thus we do not formally test whether motherhood explains a widening health gradient across cohorts. However, given the structural changes around childbearing that has recently occurred, we suggest that future studies should examine how changing prevalence and emerging or disappearing types of biographies matter for health across cohorts. Second, due to the data limitations, we focus on experiences of people who identify as women and do not consider how this may compare to experiences of parents or childfree people who are men, nonbinary, or identify with other gender categories. Given that experiences and health consequences of parenthood differ by gender, including outside of the cisgender woman context (Einiö et al., 2019), it is likely that the patterns would differ when considering men or nonbinary people. Third, we do not consider differences in childbearing biographies and health by race/ethnicity or sexuality, but, given previous research, it is highly likely that there are important differences across and within these groups (Hartnett & Brantley, 2020; Spence & Eberstein, 2009). We also expect differences across location, especially as linked to policies related to childbearing which have differential health impacts (Nagle & Samari, 2021). Future research should identify how geography and policy matter for the association between childbearing biographies and midlife health. Finally, although we adjust for SES and relationship history, we are limited in our tests of the dynamic mechanisms that likely help to account for the observed differences in health which operate across the life course. For example, changes in women's educational attainment and employment are each likely strongly tied to women's childbearing experiences and their health as previously shown (Diaz & Fiel, 2016; Frech & Damaske, 2012; Williams et al., 2015). Future analysis should consider these different selection factors and possible mechanisms to develop a richer, more life course-oriented understanding of childbearing biographies and health.

Conclusion

This study shows that the childbearing biography approach offers a key innovation in understanding how childbearing patterns relate to health at midlife beyond those demonstrated using one or two childbearing indicators. Our study has implications for gerontological research as health experiences and disparities at midlife set the stage for later-life health and well-being, using a "long-arm" approach to understanding the impact of childbearing (Hayward & Gorman, 2004). We draw attention to the role of childbearing—a life transition typically studied within the context of late adolescence and early adulthood—as uniquely important for aging researchers in understanding emerging health disparities among midlife women today (Montez & Zajacova, 2013). As childbearing biographies continue to diversify and remain closely coupled with other social contexts, such as SES, midlife health disparities will likely continue to grow, disadvantaging women who have children early in life, outside of marriage, spaced

closely together, with high parity, and with high levels of unexpected, unwanted, or mistimed births. Yet, this growing disparity is not inevitable; rather, policies aimed at supporting people regardless of when, how, and under what contexts they have children would likely reduce health disparities across childbearing groups (Glass et al., 2016), with our study identifying who is the most vulnerable and likely being left out of—or even actively harmed by—existing social structures.

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Supplemental Material

Supplement material for this article is available in online.

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