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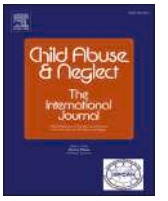

# Childhood adversity and adolescent motherhood: A cross-sectional study of trauma, partner age gaps, and parenting in the Dominican Republic

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ABSTRACT

*Background:* Adolescent pregnancy is increasingly understood as closely associated with pre-existing disadvantage, yet critical gaps remain regarding which adverse childhood experiences (ACEs) are associated with early childbearing, partner characteristics, and parenting trajectories.
*Objective:* To examine associations among ACEs, partner characteristics, and parenting practices in adolescent versus adult-onset mothers.
*Participants and setting:* We recruited 1019 mothers of children aged 24–48 months from poverty-focused programs in Santo Domingo, Dominican Republic (November 2024–January 2025), classified as current adolescent mothers ($n = 91$), former adolescent mothers ($n = 316$), or adult-onset mothers ($n = 598$).
*Methods:* Data collected via Audio Computer-Assisted Self-Interview using validated instruments: ACE questionnaire, HITS violence screen, Edinburgh Postnatal Depression Scale, and standardized parenting assessments. Analyses included correlations, chi-square tests, *t*-tests, ANOVA, and regression models.
*Results:* Emotional neglect and physical neglect showed the most consistent associations with younger maternal age at first birth, surviving FDR correction across the 10 ACE indicators ($r = -0.11$, $p$FDR $= 0.007$ and $r = -0.09$, $p$FDR $= 0.021$, respectively). In a simultaneous regression model including all 10 ACE indicators, emotional neglect remained independently associated with earlier childbearing ($\beta = -0.96$, $p = .014$); no other ACE indicators reached significance after accounting for co-occurring adversities. Mothers who started childbearing before 18 had partners who averaged 9.1 years older, compared with 2.5 years for mothers ≥26 ($p < .001$, $\eta p^2 = 0.089$); partners also had lower educational attainment (40.4% primary-only vs 13.0%). ACE scores were independently associated with intimate partner violence and depression after covariate adjustment; maternal age was not. Adult-onset mothers maintained 2.85 times the odds of university education after age adjustment. Former adolescent mothers used less violent discipline than adult-onset mothers ($d = -0.22$, $p < .001$), robust to adjustment.
*Conclusions:* The findings support the view that preexisting adversity rather than early childbearing is associated with higher psychosocial risk. Educational inequalities persisted after age

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adjustment. Former adolescent mothers' lower use of violent discipline is consistent with possible adaptation, though alternative explanations cannot be excluded.

*Research in context:* **Evidence before this study**. We searched PubMed, EBSCOhost, EMBASE, and SciSpace online databases for "adolescent pregnancy" and "early childhood development." We included publications in any language between 2015 and 2024 and screened 283 studies, plus 23 earlier studies cited in these publications; we excluded all other publications. Most examined cumulative ACE scores rather than specific adversities. Only 11 studies included the child's biological father data, focusing solely on age differences without educational characteristics. No studies examined whether parenting deficits persist as adolescent mothers mature or linked childhood emotional neglect to partner characteristics. The selection effects hypothesis suggests that preexisting disadvantage may explain poor outcomes, but evidence remained limited regarding specific mechanisms and long-term trajectories.

**Added value of this study**. We identify specific ACEs—emotional neglect and physical neglect—that show stronger associations with early childbearing than cumulative ACE scores. We document that adolescent mothers' partners average 9.1 years older at the time of the first childbirth and have lower education (40.4% primary-only versus 13.0% for older mothers' partners). In exploratory analyses, different childhood adversities show opposing associations with partner characteristics: feeling unloved was associated with younger partners, while sexual abuse and witnessing maternal intimate partner violence were associated with older partners, independent of reproductive timing—associations that did not survive correction for multiple comparisons and require replication. Comparing former adolescent mothers with adult-onset mothers, we find that former adolescent mothers use less violent discipline despite persistent adversity—a pattern consistent with a possible adaptation that was robust to covariate adjustment—while educational inequalities persist after age adjustment, with adult-onset mothers having 2.85 times the odds of university education compared to former adolescent mothers.

**Implications of all the available evidence**. Adolescent pregnancy may be better understood as closely associated with pre-existing disadvantage rather than as an independent source of disadvantage. Prevention efforts may benefit from addressing childhood trauma, particularly emotional and physical neglect, rather than focusing solely on pregnancy prevention. Programs should consider how to address power dynamics in age-asymmetric relationships while expanding opportunities for young women. The lower use of violent discipline among former adolescent mothers, if replicated, would challenge deficit perspectives and support strengths-based approaches. Healthcare systems may consider screening for childhood adversity and relationship dynamics during prenatal care as one strategy to identify women who could benefit from trauma-informed services. Future longitudinal research should examine adaptation trajectories and protective factors that enable positive outcomes despite adversity.

## 1. Introduction

Despite decades of pregnancy prevention programs, 12.2 million adolescents worldwide give birth annually (United Nations, 2024), suggesting existing approaches may not address underlying factors—in part because they conceptualize adolescent pregnancy as independent from pre-existing disadvantage, rather than as associated with it. Understanding the complex interplay between childhood experiences, partner dynamics, and maternal age at childbearing onset may shift focus from preventing adolescent pregnancy to addressing the underlying disadvantages with which it is associated. Examining the theoretical foundations of this perspective clarifies why early adversity may be central to understanding adolescent motherhood.

### *1.1. Theoretical background*

The age at which a woman begins childbearing has implications extending beyond the immediate pregnancy. The distinction between maternal age at a specific birth and at first childbirth is critical, as consequences of adolescent childbearing may affect both children born during adolescence and subsequent children, who face persistent educational challenges (Mollborn & Dennis, 2012; Tang et al., 2014). However, the selection effects hypothesis challenges deterministic interpretations of these patterns. It proposes that pre-existing disadvantages—poverty, trauma, limited opportunities—may select certain young women into early childbearing and may largely account for poor outcomes, rather than adolescent motherhood itself (Mollborn & Dennis, 2012). While this framework has been primarily developed and tested in high-income countries, the extent to which these mechanisms operate similarly across other sociocultural contexts, including variation in gender norms, family systems, and structural opportunities, remains an empirical question. The Dominican Republic, where adolescent childbearing prevalence remains high and early childhood policy infrastructure has recently expanded, provides a relevant context for examining these questions.

When controlling for social disadvantage before childbirth, maternal age's direct association with children's outcomes has been found to diminish significantly, with socioeconomic resources showing a stronger association than maternal age (Mollborn & Dennis, 2012). Evidence from the Dominican Republic suggests that maternal adversity is associated with lower levels of cultural consonance—alignment between individual lives and shared cultural models—which has been found to mediate the relationships between

adversity and parenting (Castro & Sánchez-Vincitore, 2025). A study in the United States found that each year of delayed first birth is associated with reduced child externalizing behaviors, resulting from gains in maternal education and income (Duncan et al., 2018). Because pre-existing disadvantages vary across sociocultural and economic contexts, including family structure and gender norms, our understanding shifts from locating risks in individual mothers to addressing systemic inequities. This recognizes that adolescent motherhood may represent a pragmatic response when normative pathways to adulthood are foreclosed (SmithBattle et al., 2024).

### 1.2. Knowledge gaps

Building on this theoretical foundation, three critical gaps persist in adolescent motherhood research. First, there is a limited understanding of whether adverse childhood experiences (ACEs) precede early childbearing. Second, data on the children's fathers' characteristics are scarce. Third, the extent to which parenting deficits persist as adolescent mothers mature has not been adequately examined. Although evidence suggests that partners are frequently older, the magnitude of age gaps and their association with the mother's childhood adversity remain unexplored (de Souza et al., 2007). Large age asymmetries may reflect power imbalances compounding vulnerabilities, especially when combined with educational inequities. SmithBattle et al. (2024) highlight the need to examine paternal age as a covariate, noting inconsistent results across studies. These knowledge gaps limit understanding of how partner characteristics might mitigate or exacerbate the challenges faced by adolescent mothers. The present study addresses these gaps.

### 1.3. The present study

We examine whether specific ACEs are associated with adolescent motherhood, the age and educational characteristics of partners, and whether parenting differences persist as adolescent mothers mature in the Dominican Republic, where an estimated 25,000 adolescents gave birth in 2023 (United Nations, 2024). The 2019 MICS national household survey found 16.1% of adolescents under 20 had given birth, and 2.8% were pregnant for the first time (ONE & UNICEF, 2022), and public hospitals recorded 23,397 births to mothers under 20 in 2022, accounting for 20.0% of all births (ONE, 2022). This investigation builds on prior research among this population, which demonstrated that cultural consonance plays a key mediating role in the relationship between adversity and parenting practices, providing the theoretical and empirical foundation for the current study (Castro & Sánchez-Vincitore, 2025). Additionally, the Dominican Republic offers a context with a commitment to early childhood development, as reflected in the establishment of the National Institute for Early Childhood Comprehensive Care (INAIPI) in 2013 and its formalization in 2022 through Law No. 342-22, designating the national institution responsible for the comprehensive care of children ages 0–5 years (Presidency of the Dominican Republic, 2013; Senate of the Dominican Republic, 2022). Its mandate to support healthy child development creates both an opportunity and an imperative to understand the factors that are associated with parenting practices among the estimated 212,500 families it serves. Research examining how mothers' own childhood adversity may be associated with their well-being and parenting can directly inform INAIPI's programming and support services, potentially interrupting intergenerational cycles of adversity. Finally, conducting research with INAIPI's population provides a robust safeguard for protecting study participants, as INAIPI delivers comprehensive services to mothers living in poverty, including many adolescent and former adolescent mothers. This partnership also facilitates research access to this understudied population, enabling examination of parenting processes and developmental contexts that would be difficult to study in other settings.

### 1.4. Purpose of the study

The purpose of this study was to examine how adverse childhood experiences are associated with the timing of first childbirth and related outcomes among women living in urban settings with a high concentration of poverty. We adopted a combined analytic approach, integrating hypothesis-driven questions for associations with strong empirical support and exploratory questions addressing areas with limited prior evidence in low-resource Latin American contexts. We addressed six research questions: (1) Are adverse childhood experiences associated with the timing of first childbirth among women living in urban settings with a high concentration of poverty?; (2) Does the association between childhood adversity and early motherhood reflect cumulative exposure to adversity, or are specific profiles of adverse experiences more strongly related to early childbearing?; (3) Are childhood adversity and early motherhood associated with distinct partner characteristics, particularly partner age gaps at the time of the first childbirth and educational attainment?; (4) Is there an association between the timing of first childbirth and psychosocial adversity, including intimate partner violence (IPV) and depressive symptoms?; (5) Are there differences in parenting practices between those who began childbearing during adolescence and those who began at age 20 or later?; and (6) Do former adolescent mothers experience persistent disadvantages compared to adult-onset mothers in education, material resources, psychosocial wellbeing, and partner characteristics?

### 1.5. Unique contributions

This study extends prior research in three ways. First, we examine individual ACE items rather than relying solely on cumulative scores, allowing us to identify specific adversities most strongly associated with early childbearing. Second, we provide a detailed characterization of partners' age and educational profiles, addressing a notable gap in the literature. Third, by comparing current adolescent, former adolescent, and adult-onset mothers, we can examine whether any parenting differences observed persist or change as mothers age. These analyses provide a more nuanced understanding of the associations between childhood adversity, reproductive

timing, and parenting outcomes in the Dominican Republic.

## 2. Methods

### 2.1. Participants and recruitment

We recruited 1019 mothers of children aged 24–48 months from 23 centers in Santo Domingo administered by INAIPI between November 2024 and January 2025. INAIPI provides free early childhood services to families in areas of high poverty and social vulnerability through two program types: Comprehensive Care Centers for Children and the Family (CAFI; $n = 125$ participants), which offer home visits, and Comprehensive Care Centers for Early Childhood (CAIPI; $n = 894$ participants), which are childcare centers. Centers were selected purposively to maximize coverage of the child population enrolled in INAIPI programs and to ensure the feasibility of parental recruitment. We used convenience sampling, recruiting all eligible mothers present at centers during data collection periods who agreed to participate ($N = 1019$). Because we did not track the total number of eligible participants or refusals, we cannot calculate a formal participation rate. Recruitment may have underrepresented mothers with formal employment outside the home. However, INAIPI programs primarily serve families in poverty, where informal employment and home-based work are common, potentially reducing this bias. Because refusals were not tracked, these findings apply specifically to mothers who were attending INAIPI early childhood services at participating centers and who agreed to participate, rather than to the general population of mothers in Santo Domingo or in the Dominican Republic.

### 2.2. Eligibility criteria

Inclusion criteria were: (1) biological mother of a child aged 24–48 months; (2) having that child enrolled in an INAIPI program at a participating center; and (3) able to provide informed consent. There were no exclusion criteria based on maternal age, literacy, or other characteristics. We collected the data during a larger study on cultural consonance mediating adversity-parenting relationships (Castro & Sánchez-Vincitore, 2025).

### 2.3. Terminology and age categories

All participants were biological mothers (female sex assigned at birth). We did not separately assess gender identity. We defined adolescent motherhood as the first childbirth before age 20, consistent with the World Health Organization definition of adolescence as the period from 10 to 19 years (World Health Organization, 2024). We classified mothers into different categories. First, by maternal age at first birth and age at the time of study: current adolescent (<20 years, $n = 91$), former adolescent (first birth <20, now ≥20, $n = 316$), or adult-onset (first birth ≥20, $n = 598$). Second, by age at first birth, consistent with prior research in this cohort: minor adolescent mothers (<18 years at first birth), adult adolescent mothers (18–19 years), and adult-onset mothers (≥20 years at first birth). For detailed analyses, we used five age-at-first-birth groups: <18 ($n = 205$, 20.1%), 18–19 ($n = 202$, 19.8%), 20–22 ($n = 236$, 23.2%), 23–25 ($n = 163$, 16.0%), and ≥26 years ($n = 199$, 19.5%). Throughout this manuscript, partner characteristics, including age, age gap, and educational attainment, refer to the biological father of the mother's first child, capturing the context at the time of the first childbirth. Family structure and cohabitation status refer to the mother's current living arrangements, specifically whether the biological father of the index child resides in the household and his educational attainment. Within the sample, 304 children were both the firstborn and the index child, and 42 additional index children shared the biological father with the firstborn, totaling 34.0% of the sample. Given the sex-specific nature of pregnancy and childbearing, sex-disaggregated analyses were not applicable for the primary outcomes.

### 2.4. Measures

We collected demographic data, maternal ACEs, partner violence, depressive symptoms, and parenting practices with the following instruments, all administered in Spanish.

#### 2.4.1. Sociodemographic questionnaire

It included data on maternal age at interview, age at first childbirth, date of birth of the first and the index child (aged 24–48 months), family structure and living arrangements, partner characteristics (age and education), and household material resources using a 23-item inventory of goods and assets with local cultural meaning designed for a previous study (Castro & Sánchez-Vincitore, 2025). We coded the items dichotomously (0 = not owned, 1 = owned) and summed to create a count index ranging from 0 to 23. The index was not standardized.

#### 2.4.2. Adverse childhood experiences

It provides a list of traumatic childhood experiences for participants to check whether each experience has happened to them. We used a version of the ACE questionnaire aligned with the standard 10-domain ACE framework (Felitti et al., 1998) but administered in an expanded (disaggregated) format. Specifically, while the original ACE framework comprises 10 domains, several domains are typically measured with compound questions that cover multiple experiences within a single domain. To improve specificity, we administered these compound domains as separate items, resulting in 19 binary questions (0 = no, 1 = yes). To enable comparability

with the standard ACE approach, the 19 items were subsequently collapsed into the 10 ACE domains using a prespecified rule: each domain was coded as present (1) if any of its corresponding items were endorsed (i.e., "at least one item in the domain = 1"), and absent (0) otherwise. The resulting ACE domain count was computed by summing endorsed domains, yielding a score ranging from 0 to 10, with higher scores reflecting greater cumulative adversity. Internal consistency was acceptable for the 10-domain ACE indicators (Cronbach's $\alpha = 0.78$) and good for the full 19-item set ($\alpha = 0.86$).

#### 2.4.3. Intimate partner violence

IPV was assessed using the Hurt, Insulted, Threatened with Harm, and Screamed (HITS) screening tool (Sherin et al., 1998), a 5-point Likert scale ranging from 1 (never) to 5 (frequently) that assesses experiences of physical and emotional partner violence. The instrument does not specify a fixed temporal frame and was administered based on experiences with the current or most recent partner. A composite IPV score was calculated by summing responses across the four items. Scores range from 4 to 20, with higher scores indicating greater exposure to IPV. Internal consistency in the present sample was good (Cronbach's $\alpha = 0.81$). Two scoring thresholds were applied: the standard English-language cutoff (HITS $\geq$ 11) was retained for comparability with the broader literature (Sherin et al., 1998); and the Spanish-language validated cutoff (HITS $\geq$ 6), which achieves 100% sensitivity and 86% specificity in Spanish-speaking clinical settings (Rabin et al., 2009), was applied as the primary threshold given the study was conducted in Spanish.

#### 2.4.4. Symptoms of depression

Maternal depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987), which consists of 10 items rated on a 4-point scale (0–3) and evaluates symptoms of depression during the past week. We used the Spanish-language version of the EPDS which has been validated with adequate sensitivity and specificity for detecting perinatal depression (Jadresic et al., 1995). All items were coded in the direction of increasing symptom severity, and responses were summed to create a total depression score ranging from 0 to 30, with higher scores indicating greater depressive symptomatology. The EPDS demonstrated good internal consistency in the current sample (Cronbach's $\alpha = 0.83$). A clinical cutoff of $\geq$13 was used to identify clinically significant depressive symptomatology (Cox et al., 1987; Jadresic et al., 1995).

#### 2.4.5. Child discipline practices

They were measured using items adapted from the UNICEF Multiple Indicator Cluster Surveys (MICS) Questionnaire for Children Under 5, Module on Child Discipline, an adapted version of the Parent-Child Conflict Tactics Scale (Straus et al., 1998). Caregivers reported whether specific disciplinary strategies had been used with the index child. Discipline practices were grouped into violent discipline and positive discipline composites. Violent discipline included eight forms of psychological aggression and physical punishment (e.g., yelling, shaking, hitting with objects). Positive discipline included three non-violent strategies (e.g., explaining why behavior was wrong, redirecting the child, removing privileges). Internal consistency was modest for violent discipline (Cronbach's $\alpha = 0.54$) and low for positive discipline ($\alpha = 0.27$), consistent with prior research using MICS data and reflecting the heterogeneous and situational nature of disciplinary practices (Sánchez-Vincitore & Castro, 2022). Composite scores were created by summing endorsed items, with higher scores indicating a broader repertoire of practices. The modest reliability of the violent discipline composite introduces measurement error that likely attenuates observed associations, suggesting that reported effect sizes should be interpreted as conservative estimates and replicated with psychometrically stronger instruments.

#### 2.4.6. Cognitive stimulation

Cognitive stimulation was assessed using 18 items derived from the MICS Questionnaire for Children Under 5, Module on Early Childhood Development, capturing caregiver (mother, father, other, no one) engagement in developmentally stimulating activities (e.g., reading, storytelling, singing, playing, naming objects). Items were coded to reflect whether each activity had occurred within the specified reference period and summed to create a cognitive stimulation index. The composite score demonstrated good internal consistency (Cronbach's $\alpha = 0.82$) and was analyzed as a continuous indicator of the home cognitive stimulation environment.

#### 2.4.7. Partner age gap

The partner age gap was calculated as the difference between the biological father's age and the mother's age at the birth of her first child.

### 2.5. Procedures

Research staff visited each center from November 11th, 2024, to December 12th, 2024, and from January 20th, 2025, to January 24th, 2025, and invited eligible mothers to participate during child drop-off and pick-up times and during scheduled workshops. Mothers were provided with information about the study and given time to consider participation before providing consent. Data collection was conducted privately at INAIPI centers using Audio Computer-Assisted Self-Interviews (ACASI) on tablets with headphones. An interactive avatar guided participants through the survey, enabling participation regardless of literacy while ensuring privacy. One member of the research team was present in the room during data collection to address technical issues; only participants and this staff member were permitted in the room. Data collection lasted 20–40 min. No participants reported technical difficulties. Data were de-identified immediately after collection, and identifying information was stored separately from research data.

### 2.6. Ethical review approval

All procedures complied with applicable laws and institutional guidelines. The study protocol and its subsequent amendments were approved by the institutional review boards of Tulane University (study 2023-174, approved March 10, 2023) and Universidad Iberoamericana (study CEI2023-2, approved March 6, 2023). The privacy rights of study participants have been observed. Because all study participants were INAIPI beneficiaries, referrals through INAIPI services were available whenever potential physical or mental health concerns were identified during data collection. The assent and consent procedures for minors were not applicable because all participants were at least 18 years old.

### 2.7. Data protection

Data collection used the Tangerine application with encryption in transit (TLS protocols) and at rest, stored on UNIBE cloud infrastructure compliant with PCI DSS, GLBA, and Dominican Republic Law 53-07. Access was restricted to authorized research personnel through individual credentials. Identifying information was stored separately from research data and linked only through a secure code accessible to the principal investigator. De-identified data will be retained indefinitely for replication purposes and made available to qualified researchers upon request.

### 2.8. Statistical analysis

This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for reporting cross-sectional studies (von Elm et al., 2008). We conducted data analysis using Python version 3.12.7 within the Jupyter Notebook environment with the following packages: pandas 2.2.3, numpy 2.1.3, scipy 1.15.3, statsmodels 0.14.4, scikit-learn 1.6.1, matplotlib 3.10.0, seaborn 0.13.2, and pyreadstat 1.3.0. Continuous measures of childhood adversity, psychosocial outcomes, and parenting practices were standardized as z-scores using the analytic sample as the reference distribution to facilitate comparability across measures. Maternal age at first birth was analyzed as a continuous variable and as categorical age groups (<18, 18–19, 20–22, 23–25, ≥26 years) for descriptive and group-based comparisons, as specified within each research question. Missing data were low: maternal age at first birth (1.4%, $n = 14$), biological father's age (1.7%, $n = 17$), mother–father age difference (1.7%, $n = 17$), and partner education (9.0%, $n = 92$). Patterns of missingness were associated with observed characteristics, consistent with a Missing at Random (MAR) mechanism conditional on observed variables. Therefore, primary analyses were conducted using complete-case estimation.

As a sensitivity analysis, we conducted multiple imputation (m = 20 datasets) using chained equations with Rubin's rules for pooling to verify that listwise deletion did not materially bias estimates. All statistical tests were two-tailed, and 95% confidence intervals are reported where applicable. Because participants were recruited from 23 centers across two program types (CAFI and CAIPI), we assessed potential clustering effects by calculating intraclass correlation coefficients (ICCs) for all key outcomes, re-estimating all regression models including program type as a fixed-effect covariate, and fitting mixed-effects models with random intercepts for program type. To assess potential within-center clustering, we obtained center-level identifiers for all participants and computed ICCs using one-way ANOVA variance components across 23 center groups. ICCs were negligible for all primary outcomes (range: 0.000–0.028; maternal age at first birth: ICC = 0.024; IPV: ICC = 0.008; depression: ICC = 0.013; violent discipline: ICC = 0.002). Material goods showed a modest ICC (0.072; design effect = 3.18). To confirm that standard errors were unaffected, we re-estimated all ordinary least squares (OLS) regressions using center-level cluster-robust standard errors; all statistical inferences were unchanged across every model (standard error changes ranged from −35% to +13%, with most clustered estimates being more conservative than the unclustered ones).

For analyses where confounding by age was plausible, we report both unadjusted descriptive comparisons and adjusted models controlling for relevant covariates; adjusted results are considered primary. Additionally, all regression models were re-estimated, adjusting for maternal education, household material goods, parity, and cohabitation with the biological father of the index child. For models in which ACEs are associated with maternal age at first birth, some of these covariates—particularly education and material goods—are plausible mediators rather than confounders, as ACEs temporally precede educational attainment and household resources. Because adjusting for mediators can attenuate true associations, unadjusted estimates are retained as primary for those models, with adjusted estimates reported for transparency. Models with violent discipline as the outcome additionally adjusted for child sex and child age in months; these covariates were not included in IPV or depression models, as neither is an established confounder for maternal psychosocial outcomes.

RQ1: ***Are adverse childhood experiences associated with the timing of first childbirth among women living in urban settings with a high concentration of poverty?*** Maternal age at first birth was analyzed as a continuous outcome. Associations with overall childhood adversity were first examined using Pearson correlations and ordinary least squares regression models with the total ACE score as the predictor. Regression coefficients are reported as years of difference in maternal age per additional ACE. To evaluate potential departures from linearity, a quadratic term for the ACE score was tested. To assess dose–response patterns without imposing linearity assumptions, we additionally estimated Spearman rank correlations between ACE exposure levels and maternal age at first birth and compared mean maternal age across increasing ACE categories. To evaluate the likelihood of adolescent motherhood, we estimated logistic regression models with the first birth before age 20 as the outcome and total ACE score as the predictor. Sensitivity analyses were conducted specifically for the association between total ACE score and maternal age at first birth to assess robustness to influential observations and extreme ACE values. These analyses included influence

diagnostics based on Cook's distance, alternative ACE specifications, and re-estimation of models after excluding high-influence cases. Consistency of coefficient estimates across specifications was used to evaluate the stability of findings.

RQ2: ***Does the association between childhood adversity and early motherhood reflect cumulative exposure to adversity, or are specific profiles of adverse experiences more strongly related to early childbearing?*** To examine whether specific ACEs were associated with the timing of first childbirth, we conducted exploratory analyses focusing on individual ACE indicators. Associations between each dichotomous ACE item and maternal age at first birth (continuous) were examined using point-biserial correlations. To account for multiple comparisons across the 10 ACE indicators, we applied the Benjamini–Hochberg false discovery rate (FDR) correction, defining statistical significance as an FDR-adjusted $p$-value $< .05$. To determine whether specific ACEs were independently associated with maternal age at first birth after accounting for the co-occurrence of adversities, we estimated a multiple linear regression model including all 10 ACE indicators simultaneously as predictors. This model allowed us to evaluate the independent contribution of each ACE while controlling for shared variance among adversities. Finally, to examine whether distinct patterns of co-occurring adversities were associated with the timing of first childbirth, we conducted a latent class analysis (LCA) using the 10 ACE indicators. Models with two to five classes were estimated and compared using the Bayesian Information Criterion (BIC) and entropy. The model with the best balance of statistical fit and interpretability was selected. Participants were assigned to their most likely class, and differences in maternal age at first birth across classes were examined using analysis of variance and regression models with the lowest-adversity class as the reference group.

RQ3: ***Are childhood adversity and early motherhood associated with distinct partner characteristics, particularly partner age gaps and educational attainment?*** To examine whether the timing of first childbirth and childhood adversity were associated with characteristics of the firstborn's biological father, we focused on partner age at first childbirth, mother–partner age gaps, and partner educational attainment. Differences in partner age gaps across maternal age-at-first-birth groups were examined using one-way analyses of variance (ANOVA), with post-hoc comparisons conducted using Tukey's HSD. Effect sizes for group comparisons are reported as partial $\eta^2$. Associations between maternal age at first birth and partner characteristics were further examined using Pearson or Spearman correlations, as appropriate to variable distributions. To assess whether specific ACEs were associated with partner characteristics, we compared partner age and age gaps between women who reported each adverse experience and those who did not, using independent samples $t$-tests. Regression models were then estimated to examine associations between individual ACE items and partner characteristics while controlling for maternal age at first childbirth. These analyses assessed whether observed associations were independent of the timing of childbearing. Given the number of comparisons across ten ACE items, these analyses were exploratory.

RQ4: ***Is there an association between the timing of first childbirth and psychosocial adversity, including intimate partner violence and depressive symptoms?*** Associations between maternal age at first birth (continuous) and standardized psychosocial outcomes were examined using Pearson correlations and group-based comparisons across maternal age-at-first-birth groups. Clinically significant IPV exposure and probable major depression were identified using the validated cutoffs described in the Measures section. Odds ratios comparing prevalence between the youngest (<18) and oldest (≥26) maternal age groups were estimated for each outcome. To examine whether partner educational attainment was associated with psychosocial outcomes, we compared IPV and depressive symptom scores between mothers whose partners had primary education or less and those whose partners had university education, both in the full sample and within households where the mother cohabits with the biological father of the index child. Separately, to assess whether associations between maternal age at first birth and psychosocial outcomes were attributable to current socioeconomic context, we re-estimated models adjusting for maternal education, material goods, parity, and cohabitation status. Parallel adjusted models examined whether associations between ACEs and psychosocial outcomes were robust to the same covariates. Given the multiple psychosocial outcomes examined, correlations between the total ACE score and adult psychosocial outcomes were adjusted for multiple comparisons using the FDR correction. These analyses were conducted to contextualize associations between early adversity, reproductive timing, and adult psychosocial vulnerability rather than to establish causal pathways.

RQ5: ***Are there differences in parenting practices between those who began childbearing during adolescence and those who began at age 20 or later?*** We examined parenting practices (cognitive stimulation, positive discipline, and violent discipline) in relation to maternal age at first birth, analyzed as a continuous variable across the full analytic sample. We examined associations using Pearson correlations. For violent discipline, we additionally estimated a linear regression model adjusting for maternal education, material goods, parity, cohabitation status, child sex, and child age in months. We also compared mean parenting scores across the five maternal age-at-first-birth groups (<18, 18–19, 20–22, 23–25, ≥26 years) for descriptive purposes. To examine whether family structure was associated with parenting practices, we conducted one-way analyses of variance comparing parenting scores across the ten family structure categories, with effect sizes reported as $\eta^2$.

RQ6: ***Do former adolescent mothers experience persistent disadvantages compared to adult-onset mothers in education, material resources, psychosocial wellbeing, and partner characteristics?*** To examine whether former adolescent mothers experience persistent disadvantages compared to adult-onset mothers, we restricted analyses to mothers aged 20 and older at the time of interview ($n = 914$; former adolescent $n = 316$, adult-onset $n = 598$). For educational attainment, we used logistic regression to calculate odds ratios for university degree attainment, with and without adjustment for current maternal age. For material goods ownership, we compared group means using independent samples $t$-tests and linear regression, adjusting for current age. Ownership of specific essential items (such as refrigerator, washing machine, fan) was examined using logistic regression, with adjusted odds ratios controlling for current maternal age. Psychosocial outcomes (depression, intimate partner violence) and parenting practices (violent discipline) were compared using independent samples $t$-tests, with Cohen's $d$ as an effect size

measure, and were additionally examined using linear regression adjusting for maternal education, material goods, parity, and cohabitation status to assess whether group differences were robust to socioeconomic covariates. Characteristics of the first-born's biological father (age at first birth, partner-mother age gap) were similarly compared using independent samples *t*-tests with Cohen's *d*.

### 2.9. Funding

The authors declare that the funding source played no role in the study.

## 3. Results

### 3.1. Sample characteristics

The total enrolled sample was $N = 1019$. Analyses involving maternal age at first birth used $n = 1005$ participants with complete data on this variable (14 participants, 1.4%, had missing data). Partner age analyses used $n = 1002$ (17 participants, 1.7%, had unrecoverable age gap data). Analyses requiring both variables were conducted on $n = 988$. Mothers' mean age at interview was $M = 30.61$ years (SD = 6.86), with ages ranging from 18 to 59 years. Participants were on average 21.7 years old at the time of first birth (SD = 5.1), including current adolescent mothers (<20 years; $n = 91$, 9.1%), former adolescent mothers (first birth <20, currently ≥20; $n = 316$, 31.4%), and adult-onset mothers (first birth ≥20; $n = 598$, 59.5%) (Table 1). The average number of children per mother was 2.36 (SD = 1.10, range = 1–8). Family structure varied across groups, with some differences reaching statistical significance. Adolescent mothers were less likely to live with the index child's biological father (46.2%) than former adolescent (58.2%) or adult-onset mothers (59.9%; $\chi^2(2) = 6.10$, $p = .047$), and more likely to live with the child's grandmother and no partner (16.5% vs. 5.1% and 7.4%; $\chi^2(2) = 13.37$, $p = .001$) or with a different partner (11.0% vs. 3.8% and 3.0%; $\chi^2(2) = 13.42$, $p = .001$). Former adolescent and adult-onset mothers showed highly similar living arrangements.

Material goods ownership differed significantly across groups, $F(2,1002) = 15.80$, $p < .001$, with current adolescent mothers owning the fewest items ($M = 14.16$), followed by former adolescent ($M = 15.16$) and adult-onset mothers ($M = 16.03$). After adjusting for current age, differences between former adolescent and adult-onset mothers remained significant ($\beta = -0.66$, $p = .006$). Inequities were particularly pronounced for essential items, including refrigerator ($AOR = 0.37$, 95% CI [0.23, 0.58]), washing machine ($AOR = 0.66$, 95% CI [0.46, 0.97]), and fan ownership ($AOR = 0.44$, 95% CI [0.25, 0.80]). Educational attainment varied significantly ($\chi^2$ (10) = 105.77, $p < .001$). University degree attainment increased from 6.6% among current adolescent mothers to 14.2% among former adolescent and 35.6% among adult-onset mothers. After adjusting for current age, adult-onset mothers maintained 2.85 times the odds of university education ($AOR = 2.85$, 95% CI [1.98, 4.10], $p < .001$), representing an adjusted absolute difference of 18.3 percentage points. The educational attainment of the firstborn's biological father also varied by maternal age at first birth ($\chi^2(20) = 87.28$, $p <$

**Table 1**
Demographic characteristics by maternity onset group ($N = 1019$).

| Characteristic | Current adolescent ($n = 91$) | Former adolescent ($n = 316$) | Adult-onset ($n = 598$) | $p$ |
|---|---|---|---|---|
| Age at interview, *M* (*SD*) | 20.9 (1.98) | 29.9 (5.33) | 32.4 (5.74) | <0.001 |
| Age at first birth, *M* (*SD*) | 17.6 (1.32) | 17.2 (1.55) | 24.7 (4.50) | <0.001 |
| Number of children, *M* (*SD*) | 1.32 (0.61) | 3.03 (0.99) | 2.17 (1.01) | <0.001 |
| Family structure, *n* (%) | | | | <0.001 |
| Mother alone (with child/children) | 19 (20.9) | 92 (29.1) | 162 (27.1) | |
| With index child's biological father | 42 (46.2) | 184 (58.2) | 358 (59.9) | |
| With different partner | 10 (11.0) | 12 (3.8) | 18 (3.0) | |
| With child's grandmother, no partner | 15 (16.5) | 16 (5.1) | 44 (7.4) | |
| With other adults, no partner | 5 (5.5) | 12 (3.8) | 16 (2.7) | |
| Material resources (0–23), *M* (*SD*) | 14.2 (3.5) | 15.2 (3.4) | 16.0 (3.3) | <0.001 |
| Woman's educational attainment, *n* (%) | | | | <0.001 |
| Primary or less | 26 (28.6) | 52 (16.5) | 45 (7.5) | |
| Secondary | 52 (57.1) | 191 (60.4) | 265 (44.3) | |
| Technical/vocational | 7 (7.7) | 28 (8.9) | 75 (12.5) | |
| Bachelor's degree | 6 (6.6) | 41 (13.0) | 203 (33.9) | |
| Master's degree | 0 (0.0) | 4 (1.3) | 10 (1.7) | |
| First child's biological father's educational attainment, *n* (%) | | | | <0.001 |
| Primary or less | 26 (32.9) | 91 (32.9) | 98 (17.5) | |
| Secondary | 47 (59.5) | 151 (54.5) | 301 (53.7) | |
| Technical/vocational | 4 (5.1) | 16 (5.8) | 43 (7.7) | |
| Bachelor's degree | 2 (2.5) | 18 (6.5) | 113 (20.1) | |
| Master's degree | 0 (0.0) | 1 (0.4) | 6 (1.1) | |

*Note.* Current adolescent = currently <20 years; Former adolescent = first birth <20, currently ≥20; Adult-onset = first birth ≥20. Group classification excludes 14 participants (1.4%) with missing values, yielding a total of $n = 1005$ across the three groups. Partner educational attainment has $n = 917$ for onset-group rows; 10 additional participants had partner education data but could not be classified by onset group due to missing age at first birth. *P*-values from chi-square tests for categorical variables and one-way ANOVA for continuous variables. Material resources indicate ownership of the 23 material goods most valued by this population (Castro & Sánchez-Vincitore, 2025).

.001), with a clear positive gradient ($\rho = 0.277$, $p < .001$). University degree attainment ranged from 5.3% among partners of minor adolescent mothers to 29.2% among partners of mothers aged ≥26. Notably, while partners of adolescent mothers were substantially older (age gaps of 9.1 and 7.1 years vs. 2.5 years for mothers ≥26), these older partners had lower educational attainment than expected. The correlation between partner age and education, positive overall ($\rho = 0.20$, $p < .001$), was negligible among partners of adolescent mothers ($\rho = 0.010$, $p = .895$) but strengthened progressively with maternal age ($\rho = 0.219$, $p = .003$ for mothers ≥26).

RQ1: ***Are adverse childhood experiences associated with the timing of first childbirth among women living in urban settings with a high concentration of poverty?*** A high proportion of participants (76.4%, $n = 779$) reported at least one ACE, with a mean ACE score of 2.65 (SD = 2.44) (Table 2). In addition, 32.1% of participants met the conventional threshold for high adversity, reporting four or more ACEs. The most reported ACEs were emotional neglect (41.6%), physical neglect (41.5%), and verbal abuse (40.1%).

Higher ACE scores were associated with younger age at first birth ($r = -0.07$, $p = .029$, $N = 1005$). Each additional ACE was associated with 0.15 years younger maternal age ($\beta = -0.15$, $SE = 0.07$, $p = .029$), explaining only 0.48% of the variance. A quadratic term had a minimal effect on the change in variance explained ($\Delta R^2 = 0.001$), suggesting a linear relationship. Diagnostic checks indicated that the association between ACE scores and maternal age at first birth was not driven by influential observations in the upper tail of the ACE distribution. Cook's distance analysis identified 45 observations (4.5%) exceeding the influence threshold ($4/n = 0.004$). Although mean Cook's distance values were higher among participants with ACE scores of 9–10, influential observations were distributed across the entire ACE range, with 13 of 45 high-influence cases (28.9%) occurring among participants with zero ACEs. The negative association between ACE scores and maternal age remained statistically significant across all sensitivity specifications: restricting to the modal range of ACE 0–4 ($n = 779$; $\beta = -0.27$, $SE = 0.14$, 95% CI [−0.54, −0.01], $p = .045$), winsorizing scores at 6 ($n = 1005$; $\beta = -0.16$, $SE = 0.08$, 95% CI [−0.31, −0.01], $p = .032$), and excluding high-influence observations ($n = 960$; $\beta = -0.16$, $SE = 0.06$, 95% CI [−0.28, −0.05], $p = .005$). Notably, excluding influential cases strengthened rather than attenuated the association and improved statistical precision, indicating that variability among high-ACE participants introduced noise but did not artificially inflate the observed relationship. Spearman's rank correlation showed a dose-response relationship between ACE exposure and maternal age ($\rho = -0.08$, $p = .012$; Fig. 1). Mean maternal age decreased across increasing ACE levels, from 22.61 years (SD = 5.41) among those with no ACEs to 21.22 years among those with one ACE and 21.24 years (SD = 4.77) among those with six or more ACEs. Each additional ACE was associated with 6% higher odds of adolescent motherhood ($OR = 1.06$, 95% CI [1.004, 1.112], $p = .036$). The overall pattern was consistent with a linear dose-response gradient; a quadratic term for ACE scores was non-significant, confirming no departure from linearity.

RQ2: ***Does the association between childhood adversity and early motherhood reflect cumulative exposure to adversity, or are specific profiles of adverse experiences more strongly related to early childbearing?*** Point-biserial correlations between each ACE and maternal age showed that three ACEs were significantly associated with younger maternal age: emotional neglect ($r = -0.11$, $p = .001$), physical neglect ($r = -0.09$, $p = .004$), and family member incarceration ($r = -0.07$, $p = .026$). After applying FDR correction across the 10 individual ACE items, two specific adversities remained significantly associated with younger maternal age at first birth: emotional neglect ($r = -0.11$, $p = .001$, $p$FDR = 0.007) and physical neglect ($r = -0.09$, $p = .004$, $p$FDR = 0.021). Family incarceration, while statistically significant in unadjusted analyses ($r = -0.07$, $p = .026$), did not survive correction for multiple comparisons ($p$FDR = 0.088). No other ACE items approached statistical significance (all $p$FDR > 0.17). To assess whether specific ACEs were independently associated with the timing of the first childbirth, we estimated a multiple linear regression model that included all 10 ACE indicators simultaneously. The overall model was statistically significant ($F(10, 994) = 2.61$, $p = .004$), although it explained a modest proportion of the variance in maternal age at first birth ($R^2 = 0.026$, adjusted $R^2 = 0.016$). Emotional neglect was associated with a younger age at first childbirth ($\beta = -0.96$, 95% CI [−1.72, −0.19], $p = .014$), as was family incarceration ($\beta = -0.92$, 95% CI [−1.82, −0.01], $p = .048$). No other ACE indicators showed statistically significant associations after accounting for co-occurring adversities. Variance inflation factors ranged from 1.11 to 1.78, indicating no evidence of problematic multicollinearity among predictors.

To examine whether distinct patterns of adversity were associated with the timing of first childbirth, we conducted a latent class analysis using the ten ACE indicators. Model fit indices supported a three-class solution based on the lowest Bayesian Information Criterion (BIC = 9496.6). Classification quality for this model was moderate (entropy = 0.715). The classes represented a low-adversity group (47.4%), a moderate-adversity group (36.2%), and a high-adversity group characterized by severe and multiple adversities (16.4%). Despite clear differences in exposure patterns across classes, maternal age at first birth did not significantly differ between classes, $F(2, 1002) = 1.94$, $p = .145$. In regression models using the low-adversity class as the reference group, both the high-adversity class ($\beta = -0.69$, $p = .134$) and the moderate-adversity class ($\beta = -0.61$, $p = .091$) showed a tendency toward younger ages at first childbirth, although these differences did not reach statistical significance.

RQ3: ***Are childhood adversity and early motherhood associated with distinct partner characteristics, particularly partner age gaps and educational attainment?*** One-way ANOVA comparing five maternal age groups (<18, 18–19, 20–22, 23–25, ≥26) found significant differences in partner age gaps, $F(4, 983) = 23.88$, $p < .001$, $\eta p^2 = 0.089$, 90% CI [0.061, 0.117]. Minor adolescent mothers had their firstborn with partners averaging 9.1 years older (SD = 7.7, median = 7.0 years, IQR = 3.0–13.0), while mothers aged ≥26 had partners 2.5 years older (SD = 7.3). This gap progressively decreased with increasing maternal age: 7.1

**Table 2**
Prevalence of adverse childhood experiences by maternal age at first birth ($N = 1019$).

| | ACE indicator | <18 (%) | 18–19 (%) | 20–22 (%) | 23–25 (%) | ≥26 (%) | $\chi^2/F$ | $p$ |
|---|---|---|---|---|---|---|---|---|
| ACE 1 | Verbal abuse or intimidation by parent or adult in the household | 43.9 | 41.1 | 38.6 | 38.7 | 38.7 | 1.85 | 0.763 |
| ACE 2 | Physical abuse by parent or adult in the household | 37.1 | 33.7 | 35.6 | 33.1 | 29.1 | 3.28 | 0.512 |
| ACE 3 | Sexual abuse by parent or adult in the household | 19.5 | 14.9 | 16.9 | 16.6 | 22.6 | 4.92 | 0.296 |
| ACE 4 | Emotional neglect (not feeling loved nor supported by family) | 50.2 | 47.0 | 37.3 | 38.7 | 34.7 | 15.08 | 0.005* |
| ACE 5 | Physical neglect (not enough to eat, dirty clothes, not protected, parents too drunk or high) | 50.7 | 44.1 | 40.7 | 33.1 | 37.7 | 13.69 | 0.008* |
| ACE 6 | Loss of parent (divorce/abandonment/death) | 34.6 | 29.2 | 34.3 | 36.2 | 36.7 | 3.09 | 0.543 |
| ACE 7 | Mother/stepmother experienced physical abuse | 18.5 | 14.9 | 16.5 | 12.3 | 15.1 | 2.99 | 0.559 |
| ACE 8 | Lived with alcoholic or drug user | 11.7 | 10.4 | 10.2 | 6.7 | 14.1 | 5.31 | 0.257 |
| ACE 9 | Lived with someone depressed or mentally ill | 12.7 | 13.9 | 12.7 | 11.0 | 12.1 | 0.71 | 0.950 |
| ACE 10 | Family member went to prison | 22.9 | 17.3 | 14.0 | 9.8 | 16.6 | 12.71 | 0.013* |
| | Mean ACE score (*SD*) | 3.02 (2.51) | 2.66 (2.40) | 2.57 (2.50) | 2.36 (2.06) | 2.57 (2.60) | $F = 1.87$ | 0.114 |

* $p < .05$ (unadjusted).

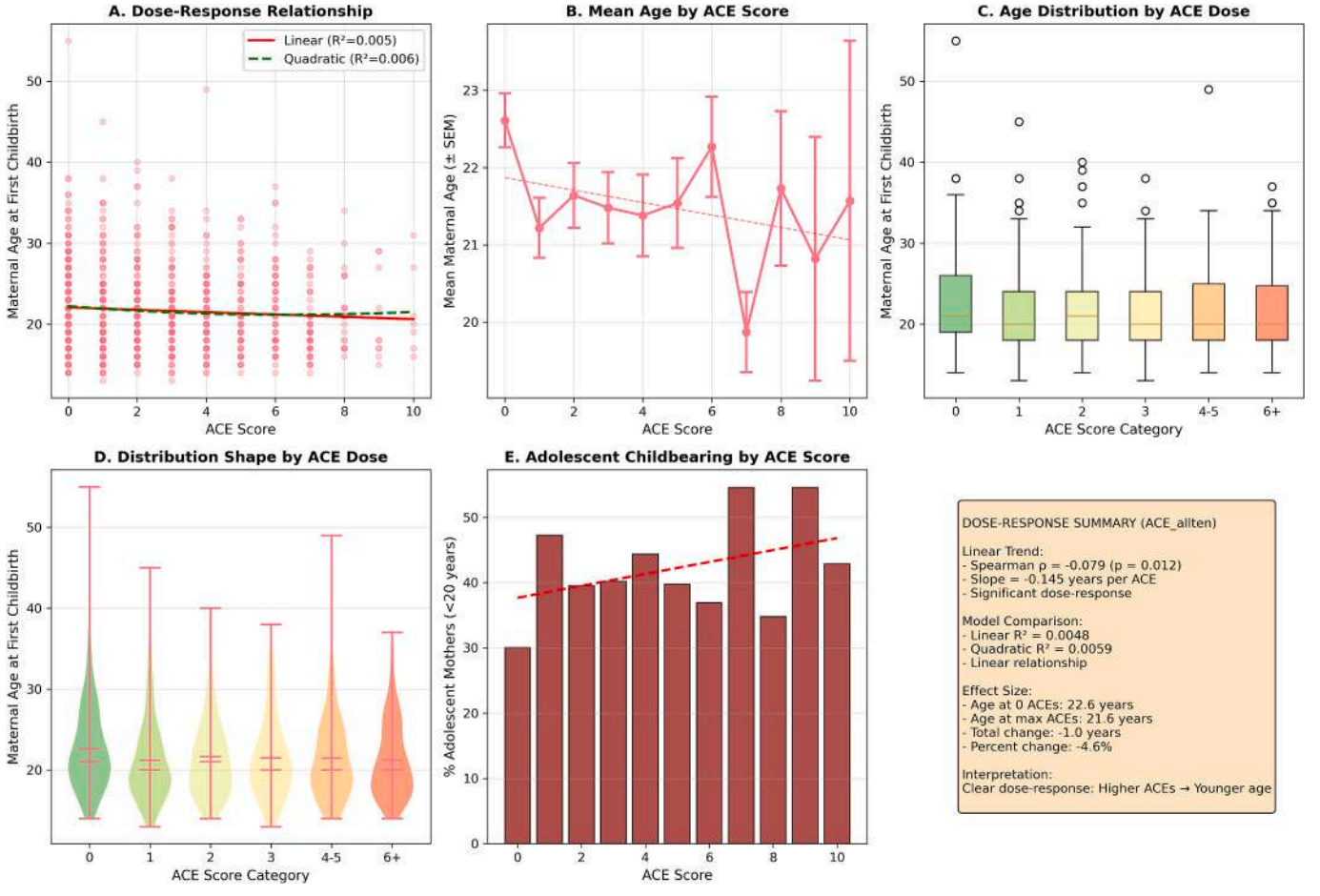


**Fig. 1.** Adverse childhood experiences and maternal age at first childbirth: dose-response analysis.
Note: Data source: Analysis of maternal age at first childbirth across Adverse Childhood Experiences (ACE) scores ($n = 1005$). Panel A displays individual observations with linear (red) and quadratic (green dashed) regression fits showing weak but significant negative correlation. Panel B presents mean maternal age ± standard error of the mean by individual ACE score, demonstrating approximately 1-year decrease from ACE 0 to ACE 10. Panel C shows box plots grouped by ACE dose categories (0, 1, 2, 3, 4–5, 6+) with medians, IQR, and outliers. Panel D illustrates distribution density using violin plots with embedded box plots for each ACE category. Panel E displays percentage of adolescent mothers (<20 years) by ACE score with linear trend line. Statistical analysis: Spearman correlation coefficient used for non-parametric assessment of dose-response relationship. Linear and quadratic models fitted to assess relationship pattern. All analyses two-tailed with significance set at $p < .05$. Key finding: Statistically significant dose-response relationship observed between ACE exposure and younger maternal age, with effect most pronounced for adolescent childbearing (first birth before age 20 increasing from ~30% at ACE = 0 to 50% at ACE ≥ 7). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

years for adolescents aged 18–19, 6.4 years for mothers aged 20–22, and 5.3 years for mothers aged 23–25 (Fig. 2). Among minor adolescent mothers, 34.2% had partners 10 or more years older, compared to 17.4% among mothers aged ≥26. Despite being older, the biological fathers of adolescent mothers' firstborns had lower educational attainment; 40.4% of them had only primary education compared to 13.0% among those of mothers aged ≥26—a threefold difference. Only 5.3% of partners of minor adolescent mothers held university degrees compared to 29.2% for mothers aged ≥26—a more than fivefold difference. The correlation between partner age and education, positive overall ($\rho = 0.19$, $p < .001$), was essentially absent among partners of adolescent mothers ($\rho = 0.01$, $p = .895$ for mothers who began childbearing before 18).

We examined associations between the total ACE score and the age of the firstborn's biological father and the age gap. Neither unadjusted ($r = -0.02$, $p = .64$ for partner age; $r = 0.03$, $p = .30$ for age gap) nor adjusted analyses ($\beta = 0.04$, $p = .64$) showed significant associations. We then examined each of the 10 ACE domains individually. In unadjusted analyses, sexual abuse showed a significant association with partner age ($r = 0.07$, $p = .02$); no ACE domain was significantly associated with age gap. After adjusting for maternal age at first birth, sexual abuse remained significant ($\beta = 1.24$, 95% CI [0.12, 2.36], $p = .030$), but this association did not survive FDR correction for multiple testing ($p$FDR = 0.30). In exploratory analyses of the 19 individual ACE items, feeling unloved was associated with younger partners ($\beta = -1.13$, 95% CI [−2.07, −0.18], $p = .019$), while witnessing their mother or stepmother being hit or slapped was associated with older partners ($\beta = 1.40$, 95% CI [0.03, 2.77], $p = .046$). Neither finding survived FDR correction ($p$FDR = 0.25 for both). Overall, ACEs showed minimal association with partner characteristics in this sample.

RQ4: ***Is there an association between the timing of first childbirth and psychosocial adversity, including intimate partner violence and depressive symptoms?*** We estimated correlations between maternal age and two outcomes: IPV exposure and depressive symptoms. Younger maternal age at first childbirth was significantly associated with higher IPV scores ($r = -0.09$, $p = .003$) and more depressive symptoms ($r = -0.12$, $p < .001$). Descriptive comparisons across maternal age groups confirmed these patterns (Fig. 3). Mothers who began childbearing before 18 reported the highest mean IPV ($M = 5.58$, $SD = 3.04$) and depressive symptom scores ($M = 9.34$, $SD = 6.18$), whereas mothers who began childbearing at ≥26 reported the lowest ($M = 4.75$, $SD = 1.79$ and $M = 7.09$, $SD = 5.41$, respectively).

Using validated clinical cutoffs, 23.1% of mothers screened positive for IPV at the Spanish-language validated threshold (HITS ≥ 6); 4.1% screened positive at the standard English-language threshold (HITS ≥ 11); and 24.1% met the threshold for probable major depression (EPDS ≥ 13). Applying the Spanish-validated threshold, positive IPV screening was highest among current adolescent mothers (28.6%), intermediate among former adolescent mothers (26.9%), and lowest among adult-onset mothers (20.1%; current adolescent vs. adult-onset: $OR = 1.59$, 95% CI [0.97, 2.62]; former adolescent vs. adult-onset: $OR = 1.47$, 95% CI [1.07, 2.02]; $\chi^2(2) = 7.22$, $p = .027$). Rates of probable major depression (EPDS ≥ 13) showed a steeper and more graduated gradient: 34.1% among current adolescent mothers, 28.2% among former adolescent mothers, and 20.2% among adult-onset mothers (current adolescent vs. adult-onset: $OR = 2.04$, 95% CI [1.26, 3.28]; former adolescent vs. adult-onset: $OR = 1.55$, 95% CI [1.13, 2.12]; $\chi^2(2) = 12.72$, $p = .002$). Both gradients were also significant across continuous age-at-first-birth groups: positive IPV screening (HITS ≥ 6) ranged from 25.9% among mothers who began childbearing before age 18 to 16.6% among those who began at ≥26 ($OR = 1.75$, 95% CI [1.08, 2.85]; $\chi^2(4) = 9.74$, $p = .045$), and probable major depression ranged from 30.7% to 18.6% ($OR = 1.94$, 95% CI [1.22, 3.09]; $\chi^2(4) = 12.26$, $p = .016$).

Women who had their first child with less-educated partners were more vulnerable: those whose partners had only primary schooling reported higher IPV scores ($M = 0.24$, SD = 1.27) than women whose partners had university education ($M = -0.18$, SD = 0.68), with positive IPV screening nearly double (32.1% vs. 17.6%, $OR = 2.21$, 95% CI [1.32, 3.71]). Mothers living with the biological father of their index child reported lower IPV than those living with a different partner ($M = -0.09$ vs. $M = 0.13$; $t = -3.53$, $p < .001$). Among mothers cohabiting with the biological father of the index child, the association remained: mothers whose partners had only primary education reported higher scores ($M = 0.22$, SD = 1.16) than those with university-educated partners ($M = -0.19$, SD = 0.61; $t(233) = 3.42$, $p < .001$, $d = 0.45$, 95% CI [0.19, 0.71]), with positive IPV screening nearly double (33.9% vs. 18.3%, $OR = 2.29$, 95% CI [1.23, 4.28]).

Similarly, women who had their first child with less-educated partners reported higher depressive symptoms ($M = 0.11$, SD = 0.98) than those whose partners had university education ($M = -0.21$, SD = 0.94; $t = 3.08$, $p = .002$, $d = 0.33$, 95% CI [0.12, 0.54]), with probable major depression more prevalent (26.1% vs. 16.9%, $OR = 1.74$, 95% CI [1.02, 2.97]). Mothers living with the biological father of their index child reported lower depressive symptoms than those living with a different partner ($M = -0.11$ vs. $M = 0.15$; $t = -4.02$, $p < .001$). Among mothers cohabiting with the biological father of the index child, the association was attenuated and no longer significant: mothers whose partners had only primary education reported higher scores ($M = 0.04$, SD = 0.95) than those with university-educated partners ($M = -0.23$, SD = 0.96; $t = 2.12$, $p = .035$, $d = 0.28$, 95% CI [0.02, 0.55]), though prevalence of probable major depression did not differ significantly (24.8% vs. 18.3%, $OR = 1.47$, 95% CI [0.77, 2.81]).

When adjusted for maternal education, material goods, parity, and cohabitation with the biological father of the index child, the associations between maternal age at first birth and both IPV (adjusted $\beta = -0.002$, $p = .735$) and depression (adjusted $\beta = -0.010$, $p = .127$) were no longer significant. Material goods and partnership status were the primary confounders. In contrast, the associations between ACEs and IPV (adjusted $\beta = 0.098$, $p < .001$) and ACEs and depression (adjusted $\beta = 0.146$, $p < .001$) remained robust, indicating that the associations between childhood adversity and these outcomes persisted after accounting for the measured socio-economic covariates.

To contextualize these associations more broadly, we examined correlations between the total ACE score and additional outcomes.

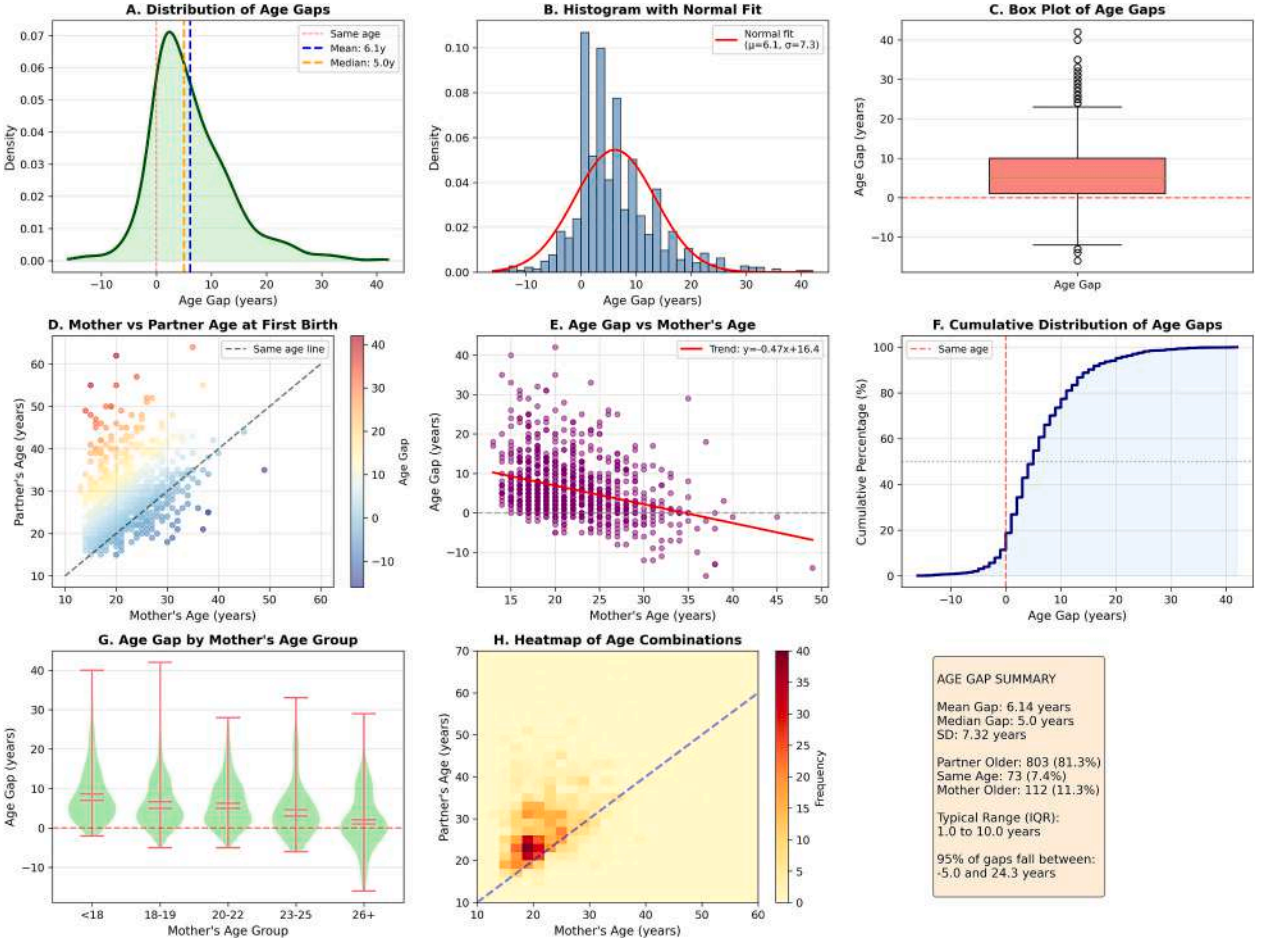


**Fig. 2.** Partner age gap analysis showing distribution and relationship with maternal age.

Notes: Data source: Analysis of age gaps between mothers and their partners at first childbirth ($n = 1002$). Age gap calculated as partner's age minus mother's age at time of first birth. Panel A shows kernel density estimate with vertical lines indicating same age (blue dashed), mean (green dotted), and median (orange dashed). Panel B displays histogram with normal distribution overlay ($\mu = 6.1$, $\sigma = 7.3$). Panel C presents box plot with median, IQR, and outliers; shaded region indicates partner older than mother. Panel D scatter plot colored by age gap magnitude with diagonal reference line for same age. Panel E demonstrates negative association between mother's age and age gap ($\beta = -0.38$, $r = -0.25$, $p < .001$). Panel F shows the cumulative distribution function with the 50th percentile marked. Panel G violin plots stratified by maternal age groups (<18, 18–19, 20–22, 23–25, ≥26). Panel H heat map displaying frequency of mother-partner age combinations. Statistical analysis: Descriptive statistics include mean gap of 6.14 years (SD = 7.32), median of 5.0 years. Distribution shows right skew with 81.3% of partnerships having older male partners, 7.4% same age (exact), and 11.3% older female partners. Typical range (IQR) spans 1.0 to 10.0 years. Key finding: Strong pattern of older male partners across all maternal ages, with age gaps decreasing as maternal age increases. Younger mothers (<18 years) show the widest variation in partner age gaps, while older mothers (≥26) demonstrate more age-concordant partnerships. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

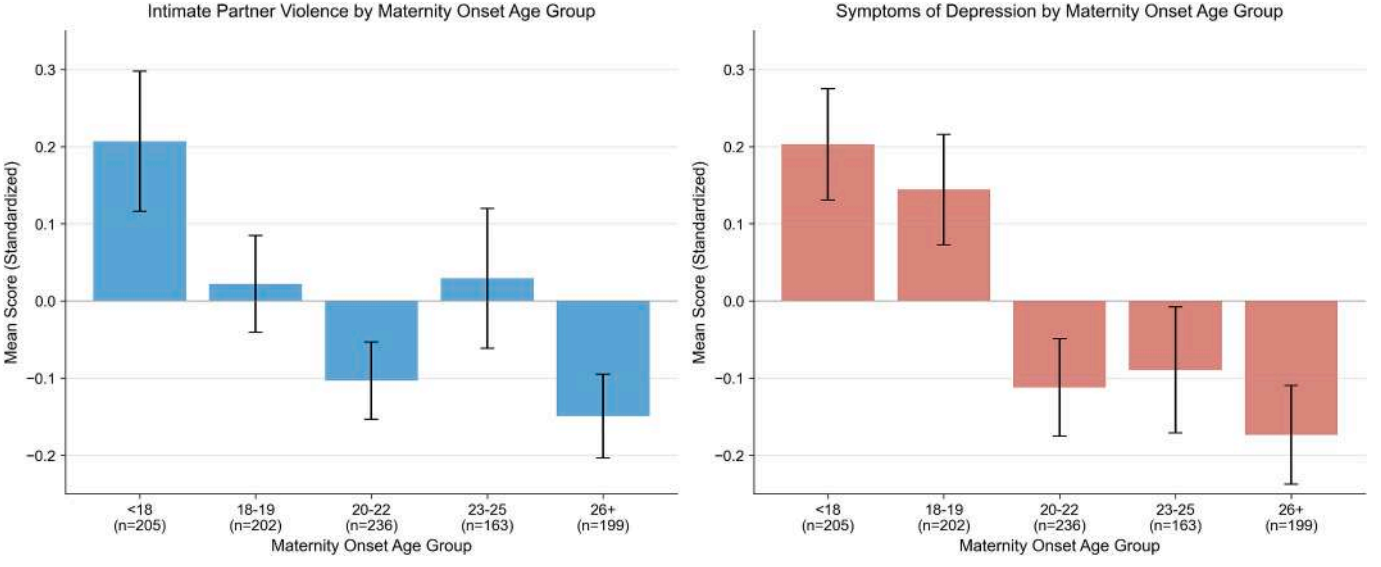


**Fig. 3.** Mean standardized scores for intimate partner violence and depressive symptoms by maternal age at first childbirth. Notes: Data: Standardized scores for IPV exposure and depression symptoms across maternal age groups at first childbirth ($N = 1005$). Scores are z-standardized (mean = 0, SD = 1). Error bars represent 95% confidence intervals. Intimate partner violence panel: Adolescent mothers (<18) show highest IPV exposure (0.21 SD above mean). IPV scores are near the mean for ages 18–19 (0.02 SD) and 23–25 (0.03 SD), below the mean for ages 20–22 (−0.10 SD), with lowest IPV rates observed in mothers ≥26 (−0.15 SD). Symptoms of depression panel: Youngest mothers (<18, 18–19) exhibit elevated depression symptoms (0.20 and 0.14 SD above mean, respectively). Depression scores are below the mean for mothers 20–22 (−0.11 SD), 23–25 (−0.09 SD), and reach lowest levels in mothers ≥26 (−0.17 SD). Key finding: Both IPV exposure and depression symptoms are elevated among adolescent mothers, with the youngest mothers (<18) showing the highest levels of both outcomes.

ACEs were positively correlated with violent discipline ($r = 0.30$, $p < .001$), positive discipline ($r = 0.09$, $p = .004$) and negatively correlated with cognitive stimulation ($r = -0.06$, $p = .042$) and material goods ($r = -0.16$, $p < .001$). All ACE–outcome correlations, including those with IPV ($r = 0.29$) and depression ($r = 0.40$), survived FDR correction, indicating that childhood adversity was associated with multiple domains of adult functioning independently of multiple testing.

RQ5: ***Are there differences in parenting practices between those who began childbearing during adolescence and those who began at age 20 or later?*** We examined parenting practices across maternal age groups at first childbirth, focusing on cognitive stimulation, positive discipline, and violent discipline (Fig. 4). While stimulation showed no significant correlation with maternal age ($r = 0.043$, $p = .172$), mean scores increased from younger to older mothers ($-0.11$ for <18 years to 0.11 for ≥26 years). Positive discipline showed no significant differences across age groups ($r = 0.038$, $p = .235$). Violent discipline showed a significant positive correlation with maternal age ($r = 0.159$, $p < .001$), explaining 2.5% of variance, with mothers under 18 years at first birth reporting the lowest use ($M = -0.12$, SD = 0.82) and mothers aged 26 or older reporting the highest ($M = 0.26$, SD = 1.17), a 0.38 standard deviation increase ($\beta = 0.031$, $p < .001$).

Analyses of variance showed that family structure was a significant predictor of cognitive stimulation ($F(9, 995) = 6.40$, $p < .001$), accounting for 5.5% of the variance. Mothers living alone with the child or children provided less stimulation ($M = -0.29$ for single child, $-0.23$ for multiple children) compared to mothers living with the child's biological father ($M = 0.19$), a difference of 0.48 SD. Mothers living with a different partner also showed significantly lower stimulation than mothers living with the child's biological father ($M = -0.41$, $p = .012$), though they did not differ significantly from mothers living alone. Family structure showed no significant effect on positive ($F = 0.46$, $p = .902$) or violent discipline ($F = 0.37$, $p = .950$).

RQ6: ***Do former adolescent mothers experience persistent disadvantages compared to adult-onset mothers in education, material resources, psychosocial wellbeing, and partner characteristics?*** We compared mothers aged 20 and older by the timing of maternity onset. Adult-onset mothers had 3.33 times the odds of attaining a university education ($OR = 3.33$, 95% CI [2.33, 4.76], $p < .001$) and maintained 2.85 times the odds ($AOR = 2.85$, 95% CI [1.98, 4.10], $p < .001$) after adjusting for current age. Only 14.2% of former adolescent mothers had attained a university education, compared to 35.6% of adult-onset mothers. Material disadvantage also persisted. In unadjusted analyses, former adolescent mothers owned 0.87 fewer material goods than adult-onset mothers ($p < .001$). This difference remained significant after controlling for current age ($\beta = -0.66$, $p = .006$).

Former adolescent mothers experienced higher adversity in adulthood. They reported more depression than adult-onset mothers ($M = 0.13$, $SD = 1.00$ vs. $M = -0.13$, $SD = 0.97$), $t(912) = 3.73$, $p < .001$, $d = 0.26$, 95% CI [0.12, 0.40] and more intimate partner violence ($M = 0.13$, $SD = 1.15$ vs. $M = -0.08$, $SD = 0.89$), $t(912) = 3.03$, $p = .003$, $d = 0.21$, 95% CI [0.07, 0.35]. After adjusting for maternal education, material goods, parity, and cohabitation with the biological father of the index child, the depression difference remained significant ($\beta = 0.17$, $p = .022$), while the IPV difference was no longer significant ($\beta = 0.07$, $p = .312$), with material goods and partnership status accounting for the group difference.

Despite this ongoing adversity, former adolescent mothers used significantly less violent discipline ($M = -0.15$, $SD = 0.85$) than adult-onset mothers ($M = 0.07$, $SD = 1.07$), $t(912) = -3.23$, $p < .001$, $d = -0.22$, 95% CI [−0.36, −0.09]; this difference was robust to covariate adjustment ($\beta = -0.21$, $p = .006$). Results were unchanged when child sex and child age were added to the covariate set ($\beta = -0.22$, $p = .006$); neither child sex ($\beta = 0.10$, $p = .158$) nor child age ($\beta = -0.003$, $p = .595$) was independently associated with violent discipline.

The biological fathers of the first child of former adolescent mothers were younger ($M = 25.86$ years) than those of adult-onset mothers ($M = 29.42$ years), $t(896) = -6.95$, $p < .001$, $d = -0.49$, 95% CI [−0.63, −0.35], yet age gaps remained larger (8.71 vs. 5.28 years), $t(877) = 6.92$, $p < .001$, $d = 0.49$, 95% CI [0.35, 0.63].

### 3.2. Robustness and clustering checks

Intraclass correlation coefficients indicated minimal clustering across all outcomes at the center level ($k = 32$). ICCs ranged from 0.000 (positive discipline) to 0.072 (material goods), with all primary outcomes falling well below the conventional threshold of 0.05: maternal age at first birth (ICC = 0.024), depression (ICC = 0.013), IPV (ICC = 0.008), and violent discipline (ICC = 0.002). Material goods showed a modest ICC (0.072; design effect = 3.18), consistent with centers serving geographically defined neighborhoods. Re-estimating all OLS regressions with center-level, cluster-robust standard errors produced identical point estimates across all models, with standard errors ranging from −35.1% to +12.9%. For the association between ACE scores and maternal age, standard OLS yielded $\beta = -0.145$ ($p = .029$) and the cluster-robust model yielded $\beta = -0.145$ ($p = .031$). No finding reported as statistically significant lost significance under clustering, and no null finding became significant.

Mothers with missing partner education (9.0%) were younger at first birth ($M = 20.3$ vs. 21.8 years, $p = .009$), had higher ACE scores ($M = 3.2$ vs. 2.6, $p = .018$), and reported more depressive symptoms ($d = -0.43$, $p < .001$), consistent with a MAR pattern conditional on observed variables. Multiple imputation ($m = 20$, Rubin's rules) produced estimates consistent with complete-case results across all primary models, including the association between ACE scores and maternal age at first birth ($\beta = -0.148$, $SE = 0.07$, $p = .038$), consistent with the modest magnitude of the original effect. All significance conclusions remained unchanged.

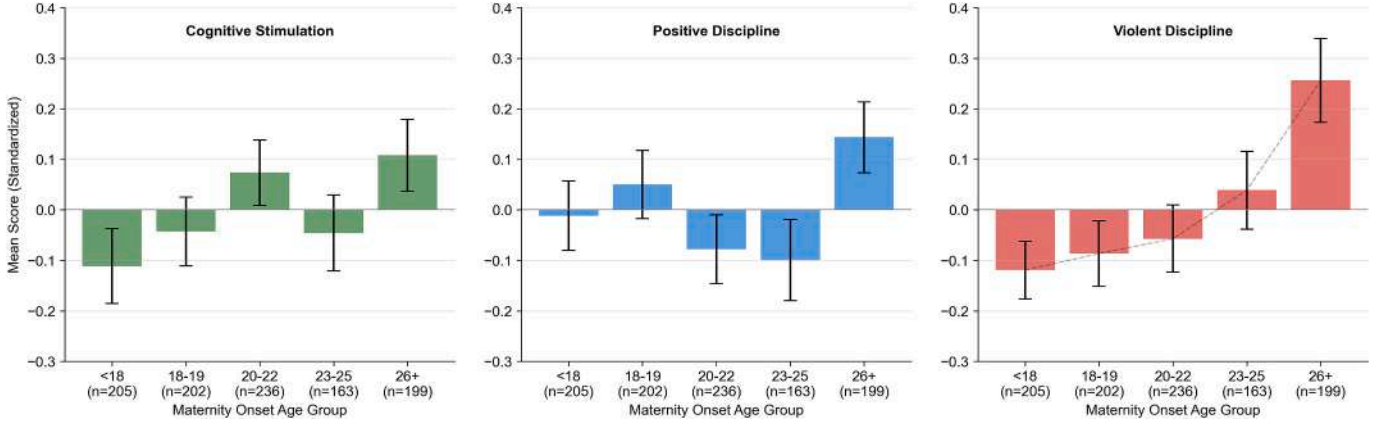


**Fig. 4.** Parenting outcomes by maternal age at first childbirth.

Notes: Data: Standardized parenting behavior scores across maternal age groups at first childbirth ($N = 1005$). Scores represent z-standardized measures (mean = 0, SD = 1) for three parenting domains. Error bars represent 95% confidence intervals. Cognitive stimulation includes reading, educational activities, and learning support. Positive discipline encompasses non-punitive guidance strategies and constructive correction. Violent discipline measures physical punishment and harsh disciplinary practices.

## 4. Discussion

Our findings can be understood through an integrative theoretical framework. First, the selection effects hypothesis (Mollborn & Dennis, 2012; SmithBattle et al., 2024) provides the organizing framework: preexisting adversity—particularly emotional and physical neglect—is associated with earlier childbearing, supporting the view that adolescent motherhood may be better understood as a marker of prior disadvantage rather than as an independent source of disadvantage. Second, ecological systems theory (Bronfenbrenner, 1979) helps contextualize the partner characteristics findings: the age and educational profiles of partners represent microsystem characteristics that co-occur with maternal childhood experiences and may co-occur with developmental contexts for the next generation. Third, the lower use of violent discipline among former adolescent mothers, which was robust to covariate adjustment, is consistent with adaptation perspectives within life-course theory (Elder Jr., 1998), challenging deterministic cumulative disadvantage models, though the small effect size ($d = -0.22$) and plausible alternative explanations, such as differential exposure to INAIPI parenting education programs, warrant cautious interpretation. This pattern contrasts with data from the most recent MICS 2019 household survey from the Dominican Republic (ONE & UNICEF, 2022), with which we estimated that mothers who gave birth before age 20 reported higher use of violent discipline ($\bar{x} = 0.20$, SD = 0.19 vs. $\bar{x} = 0.16$, SD = 0.17; $d = 0.20$, $p < .001$) compared to mothers who gave birth at age 20 or older, a pattern explored in depth among a smaller sample (Nelson et al., 2025). Finally, the intersection of age, gender, education, and childhood adversity creates compounded vulnerability, consistent with intersectionality theory (Crenshaw, 1989).

Our most significant contribution identifies emotional neglect as the most stable correlate of earlier reproductive timing; physical neglect was associated in bivariate analyses but did not remain significant when all ACEs were modeled simultaneously. Family incarceration showed an association in the simultaneous model but did not survive FDR correction and should be interpreted as a weaker, exploratory finding. While previous research documented higher ACE scores among adolescent mothers (Hillis et al., 2004), we identify differential associations across adversities. The linear dose-response gradient, in which each additional ACE was associated with younger age at first birth, suggests that childhood adversity is associated with earlier childbearing through cumulative exposure rather than a threshold mechanism.

We present exploratory evidence that specific childhood adversities may be differentially associated with partner age, though none of these associations survived FDR correction and all should be interpreted with caution. Feeling unloved was associated with younger partners, an association that persisted after adjustment for maternal age. In contrast, sexual abuse and witnessing maternal intimate partner violence were associated with older partners, independent of reproductive timing. These patterns are preliminary and require replication before any mechanistic interpretation is warranted. The cross-sectional design cannot confirm these as distinct pathways.

The substantial age gaps for mothers who began childbearing before 18 suggest relationships characterized by power imbalances, consistent with previous observations (de Souza et al., 2007). However, our contribution lies in documenting an educational paradox: despite being older, these partners had significantly lower educational attainment than expected. Several competing explanations may account for this pattern: partners may be drawn from similarly disadvantaged backgrounds regardless of age; older men with limited education may be more available in local labor markets; partnerships with better-educated men may dissolve more readily, leaving less-educated partners overrepresented at the time of measurement; measurement error in educational attainment; or selection into INAIPI programs. Future research controlling for men's employment status, income, and union stability could help adjudicate among these possibilities.

An unexpected finding is that former adolescent mothers used less violent discipline than women who delayed childbearing, despite experiencing higher levels of depression and intimate partner violence. This small but significant effect ($d = -0.22$) was robust to adjustment for maternal education, material goods, parity, and cohabitation status ($\beta = -0.21$, $p = .006$), suggesting it is not attributable to measured confounders. This pattern is inconsistent with deficit-focused narratives and is consistent with possible adaptation. Several hypotheses may explain this pattern: accumulated parenting experience may be associated with effective discipline strategies; targeted INAIPI interventions may have emphasized positive parenting; or selection effects may operate, with adolescent mothers who successfully navigate early parenthood representing a particularly adaptable subgroup. However, differential reporting patterns, differential exposure to INAIPI programming, and the modest effect size all warrant cautious interpretation pending replication in independent prospective samples.

Previous work from this cohort demonstrated that cultural consonance mediates adversity-parenting relationships, with family dynamics consonance protecting against violent discipline, while material-social consonance unexpectedly increased it (Castro & Sánchez-Vincitore, 2025). This suggests that early childbearing within supportive family contexts could facilitate responses not captured by traditional deficit models. Yet educational inequalities persist—adult-onset mothers maintained 2.85 times the odds of university education after age adjustment—illustrating the distinction between behavioral adaptation and structural disadvantage.

Our findings suggest several directions for policy and practice, each tied to specific results. First, the association between emotional neglect and earlier childbearing is consistent with the potential utility of screening for childhood adversity during prenatal and reproductive health care as one strategy to identify women who could benefit from trauma-informed services, though the cross-sectional design does not establish that such screening would alter reproductive outcomes. Second, the documentation of substantial age gaps (averaging 9.1 years for mothers <18) and lower partner education highlights the potential value of counseling on relationship power dynamics and safety planning, particularly for adolescent mothers experiencing IPV. Third, the finding that former adolescent mothers use less violent discipline toward their children (contrary to deficit perspectives), if confirmed in longitudinal research, would support strengths-based approaches that build on young mothers' capacities rather than focusing solely on deficits. Structural interventions—including flexible education pathways, childcare provision, and economic support—remain essential for addressing persistent educational inequalities.

The main limitation is that the cross-sectional design prevents causal inference; all associations should be interpreted as such, and the theoretical mechanisms discussed represent hypotheses rather than confirmed causal pathways. Additional limitations include: reliance on self-report measures, which may be subject to social desirability bias particularly for parenting items and IPV; retrospective assessment of ACEs, which may be affected by recall bias; potential measurement invariance of scales across age groups; missingness in partner education data (9.0%), which was associated with younger maternal age, higher ACE scores, and more depressive symptoms (MAR pattern) although multiple imputation confirmed that complete-case estimates were not materially biased; and possible engagement bias, as mothers who participate in INAIPI services may differ systematically from non-participating mothers in ways associated with the outcomes examined here, such as greater motivation to seek support, greater program accessibility, or fewer barriers to attendance.

Sampling from INAIPI centers in Santo Domingo during specific periods (November–January) may limit the external validity of the findings to program participants in urban settings. Additionally, INAIPI enrollment patterns may reflect differential access to services, and cultural norms regarding age-asymmetric partnerships in the Dominican Republic may differ from those in other contexts, affecting the interpretation and generalizability of partner age findings.

Future longitudinal research should investigate how childhood neglect, partner characteristics, and parenting evolve over time and how protective factors, particularly family dynamics that buffer against violent discipline (Castro & Sánchez-Vincitore, 2025), can inform strengths-based interventions. Cross-cultural comparisons could test generalizability beyond the Dominican context.

## 5. Conclusion

This study extends prior research on adolescent motherhood and provides evidence consistent with the view that it may primarily reflect accumulated adversity, particularly childhood emotional neglect, which was the most stable correlate across analyses, rather than being the primary cause of disadvantage. Physical neglect was associated in bivariate analyses but did not remain significant in simultaneous models. Family incarceration showed an association in the simultaneous model but did not survive FDR correction and should be treated as a preliminary finding requiring replication. Exploratory analyses suggested differential associations between specific childhood adversities and partner characteristics, though these findings did not survive correction for multiple comparisons and require replication.

These findings are based on cross-sectional, self-reported data and thus should inform hypotheses for future longitudinal research rather than confirm causal models. The observed associations between childhood adversity, reproductive timing, and parenting outcomes suggest that addressing factors that co-occur with adolescent pregnancy—childhood trauma and structural inequities—warrants further investigation, alongside recognition of young mothers' capacity for adaptation.

## Data sharing statement

De-identified individual participant data underlying the results reported in this article will be made available immediately following publication, with no end date. Data will be available to researchers who provide a methodologically sound proposal, with approval by the investigator team. Proposals should be directed to the corresponding author. Data requestors will need to sign a data access agreement.

## CRediT authorship contribution statement

**Arachu Castro:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Laura V. Sánchez-Vincitore:** Writing – review & editing, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

## Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used Claude Opus 4.5 (Anthropic) to improve the manuscript's readability and language. The authors reviewed and edited the content as needed and take full responsibility for the published article.

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## Declaration of competing interest

We declare no competing interests.

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## Data availability

Data will be made available on request.

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