

Is there more to the story? The added predictive value of expanded Adverse Childhood Experiences in maternal mental health during pregnancy

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ABSTRACT

Background: Adverse Childhood Experiences (ACEs) are strongly linked to maternal mental health difficulties during pregnancy, affecting both mother and child through intergenerational transmission. Traditional ACEs frameworks have focused on family-related adversities, however, expanded models include broader social and community factors. Despite this, few studies have compared the predictive value of traditional versus expanded ACEs in pregnancy mental health.

Aim: This cross-sectional study examines whether expanded ACEs improve prediction of pregnancy-related anxiety, depression, and pregnancy adaptation difficulties beyond traditional ACEs.

Methods: The study included 306 pregnant women from Spain who completed assessments using the Pregnancy-Related Anxiety Questionnaire-20 (PRAQ-20), Patient Health Questionnaire-9 (PHQ-9), and Prenatal Self-Assessment Questionnaire (PSQ). Traditional ACEs and expanded ACEs (such as parental absence, unsafe neighbourhoods or financial hardship) were also measured.

Findings: Hierarchical regression analyses evaluated the effects of ACEs on maternal mental health outcomes, controlling for age and socioeconomic status. Expanded ACEs significantly improved prediction of pregnancy-related anxiety, depression, and pregnancy adaptation difficulties beyond traditional ACEs. Community-level adversities, such as unsafe neighbourhoods and parental absence, were key predictors, while traditional ACEs showed weaker associations. **Conclusions:** Incorporating expanded ACEs in perinatal assessments enhances identification of pregnant women at risk and supports trauma-informed, context-sensitive care. Longitudinal studies are needed to explore long-term effects on maternal and child health.

Statement of significance: Problem or Issue. Adverse Childhood Experiences (ACEs) are strongly associated with maternal mental health difficulties during pregnancy, which can affect both mother and child through intergenerational transmission. Traditional ACE frameworks focus primarily on family-related adversities, potentially overlooking broader social and community factors. Few studies have examined whether expanded ACEs better predict maternal mental health outcomes during pregnancy. **What is Already Known.** Traditional ACEs, such as abuse or neglect, are linked to depression, anxiety, and pregnancy maladjustment. Expanded ACE models, which include community-level and peer-related adversities, may provide additional predictive value, but research in pregnant populations is limited. Identifying these broader influences could improve early detection of at-risk women. **What this Paper Adds.** This study shows that expanded ACEs, including parental absence and unsafe neighbourhoods, significantly improve prediction of pregnancy-related anxiety, depression, and adaptation difficulties during pregnancy beyond traditional ACEs. Findings highlight the importance of incorporating broader, context-sensitive assessments in perinatal care to identify women at risk and guide trauma-informed interventions.

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Adverse Childhood Experiences (ACEs) have been consistently identified as critical determinants of lifelong health and well-being (Felitti et al., 1998; Hughes et al., 2017). Over the past two decades, there has been a considerable expansion in the understanding of how early-life adversities shape developmental trajectories and influence health outcomes across the lifespan. The original ACEs framework, established through the landmark CDC-Kaiser Permanente study, conceptualised childhood adversity within the familial context. It focused on three main categories: abuse (physical, emotional, sexual), neglect (physical, emotional), and household dysfunction, including parental separation, domestic violence, substance abuse, mental illness, and incarceration (Anda et al., 2006; Felitti et al., 1998). This framework has been instrumental in establishing a robust evidence base linking ACEs to various negative health outcomes, including cardiovascular disease (Godoy et al., 2021), depression (Gomis-Pomares and Villanueva, 2023; Racine et al., 2021), criminal behaviour (Basto-Pereira et al., 2022), substance abuse (Leza et al., 2021; Villanueva and Gomis-Pomares, 2020), and reduced life expectancy (Felitti et al., 1998).

Despite the important contributions of the traditional ACEs framework to public health, recent research has highlighted several limitations, particularly regarding ecological validity. The conventional ACEs model has been criticised for its narrow focus on family-level adversities, often overlooking broader social and community factors that significantly influence child development (Finkelhor, 2020; McLennan et al., 2020). Some researchers argue that this limited scope may fail to capture the full range of adverse experiences impacting developmental outcomes, especially for populations facing structural inequalities and environmental stressors (Cronholm et al., 2015; Mersky et al., 2017). Additionally, concerns have been raised that without trauma-informed approaches, ACEs assessments might unintentionally contribute to re-traumatisation and stigmatisation of individuals (Finkelhor et al., 2015; Racine et al., 2018). These issues have led to growing calls for broadening the ACEs framework to better reflect the diverse socio-ecological contexts in which development occurs.

In response, expanded ACEs frameworks have been proposed to include a wider array of childhood adversities beyond the traditional family-centred focus (Mersky et al., 2017; [WHO] World Health Organization, 2018). These extended models incorporate additional factors such as bullying, community violence, discrimination, economic hardship, unsafe neighbourhoods, or parental absence (Finkelhor et al., 2015). In this context, expanded ACEs are hypothesised to offer incremental predictive value by capturing adversities beyond the immediate family environment, which may affect stress regulation, emotional coping, and adaptive processes through distinct mechanisms (Cronholm et al., 2015). During pregnancy, a period of heightened biological and psychological vulnerability, these broader adversities may be reactivated, exacerbating anxiety and emotion dysregulation (Glynn et al., 2013), while their lasting impact on social and economic resources may constrain women's capacity to manage the demands of the perinatal period (Sosnowski, et al., 2023). Emerging evidence indicates that these broader frameworks not only enhance the prediction of adverse outcomes but also provide a more nuanced understanding of the mechanisms through which early adversity impacts well-being (Karatekin and Hill, 2019; Mersky et al., 2017).

This broader perspective is particularly relevant to maternal mental health research, where strong associations have been established between ACEs and mental health difficulties during pregnancy. Mental illnesses such as anxiety and depression affect approximately 20–30% of women in low- and middle-income countries and around 10% in high-income countries during pregnancy or the postpartum period (Ångerud et al., 2018; Racine et al., 2021). Furthermore, in prenatal care settings, nearly half of pregnant women report experiencing at least one childhood adversity, with some samples indicating that over 60% report at least one ACE and 20% report four or more (Racine et al., 2021). Consequently, the relationship between ACEs and maternal health during pregnancy represents a critical area of investigation, particularly

given the potential for intergenerational transmission of adversity (Bouvette-Turcot et al., 2013; Ishikawa et al., 2022).

In this regard, women with histories of ACEs have been found to experience elevated difficulties in adapting to pregnancy (Atzl et al., 2019; Smith et al., 2016), and prenatal maternal distress has been linked to adverse birth outcomes as well as subsequent child developmental trajectories, highlighting the potential intergenerational impact of maternal ACEs (Buss et al., 2017; Kang et al., 2021; McDonald et al., 2019). Research on the cumulative effects of ACEs suggests that the total number of adversities experienced may serve as a stronger predictor of negative maternal and child outcomes than any single adversity alone (Hinesley et al., 2020). However, evidence also indicates that certain ACEs (particularly emotional abuse and household dysfunction) may exert especially robust associations with maternal mental health difficulties (Petrucelli et al., 2019). Examining both cumulative and specific maternal ACEs is crucial during pregnancy, a period of heightened neurobiological and psychological vulnerability (e.g., HPA axis changes, maternal identity formation) that may reactivate early trauma responses (Glynn et al., 2013; Slade et al., 2009). Understanding distinct ACE patterns informs targeted interventions, supports maternal coping, and helps mitigate risks to prenatal development and intergenerational trauma (Van den Bergh et al., 2020).

Despite the increasing recognition of the value of expanded ACEs frameworks, empirical research systematically comparing the predictive utility and ecological validity of traditional versus expanded models remains scarce, especially in the context of maternal mental health (Danese et al., 2024). Understanding whether incorporating expanded ACEs contributes additional explanatory power to the prediction of pregnancy-related mental health outcomes carries important implications for research and clinical practice. Enhanced ecological validity in ACEs assessment could improve the identification of at-risk women, refine intervention strategies, and help to disrupt cycles of intergenerational adversity (Nurius et al., 2015; Racine et al., 2018). Nonetheless, meta-analytic reviews indicate that most research on maternal ACEs has been conducted in North American populations, which limits the generalisability of findings to other cultural and national contexts (Racine et al., 2021). Concurrently, implementation studies suggest that ACEs screening in prenatal care is feasible and well accepted by both patients and clinicians, provided it is delivered with appropriate training and trauma-informed practices (Flanagan et al., 2018). Despite this, further empirical studies are required to establish whether expanded ACEs frameworks enhance ecological validity and predictive utility beyond traditional models in the pregnancy context. Examining both cumulative ACE burden, grounded in allostatic load theory recognising synergistic effects of multiple adversities (Evans et al., 2013; McEwen, 2007), and specific ACE categories that operate through distinct mechanisms, is essential for understanding how different patterns of early adversity shape maternal mental health outcomes and for informing targeted interventions across varied populations. Thus, the present study aims to address these gaps by examining whether the inclusion of expanded ACEs, as conceptualised by Mersky et al. (2017) and the World Health Organization (2018) enhances the ecological validity of ACEs assessments in predicting adverse maternal mental health outcomes during pregnancy, particularly on pregnancy-related anxiety, depression, and difficulties in pregnancy adaptation in a Spanish population. We hypothesise that: (1) the inclusion of expanded ACEs will provide incremental predictive value beyond traditional ACEs, thereby enhancing the ecological validity of ACEs assessments in relation to maternal mental health; and (2) specific ACEs (both traditional and expanded) will differentially predict pregnancy-related anxiety, depression, and difficulties in pregnancy adaptation, offering insights to inform targeted prevention and intervention strategies.

Method

Instruments

Sociodemographic Questionnaire. This questionnaire was designed to collect comprehensive information on participants' age, nationality, socioeconomic status (SES), educational attainment, employment status, family context, parity, and health-related factors. Family context variables included the presence of a partner, assessed dichotomously (yes/no), and number of previous children (self-reported by the mothers as a numerical value). Health-related variables encompassed physical illnesses, psychological difficulties, prior psychological therapy, serious partner conflicts, experiences of violence, and involvement in legal proceedings and were all assessed as binary variables (yes/no). If the person was financially independent, their own SES was used; otherwise, SES was determined based on their parents' professions and education. SES was categorised into three levels: high (managerial/professional), medium (intermediate/skilled), and low (routine/semi-routine work). This classification demonstrated high inter-judge reliability ($\kappa = 0.82$).

The Adverse Childhood Experiences (ACE) Questionnaire (Felitti et al., 1998), is a self-report instrument which measures 10 types of adverse experiences that individuals may undergo during childhood and adolescence. These include sexual, physical, and emotional abuse; physical and emotional neglect; and household dysfunction such as living in a household affected by domestic violence, parental divorce, household substance abuse, mental illness, or incarceration of a household member. Each adverse experience was scored according to the original authors' instructions (Felitti et al., 1998; Pinto et al., 2014) and coded as a binary variable (0 = absence, 1 = presence), with total scores calculated for each participant, ranging from 0 to 10 for the traditional ACEs. Some examples of items include: "Did the people in your family feel close to each other?" or "Was anyone in your household depressed or had a mental illness?" Previous studies have demonstrated good psychometric properties for the questionnaire, including Spanish populations (Pinto et al., 2014; Villanueva et al., 2026).

Expanded Version of the Adverse Childhood Experiences Questionnaire (Mersky et al., 2017; [WHO] World Health Organization, 2018). An expanded assessment of ACEs was employed, based on the seven-item scale developed by Mersky et al. (2017) and the WHO (2018). This version broadens the original ACE framework to include experiences beyond the immediate family context. The assessed experiences included: the death of a parent or sibling, parental absence, living in an unsafe neighbourhood, exposure to violent crime, financial hardship and homelessness. Examples of items include: "How often were you homeless when you were growing up?" or "Before age 18, were you ever the victim of a violent crime?". All items were scored dichotomously (0 = absence, 1 = presence), with total scores calculated for each participant, ranging from 0 to 6 on the expanded ACE scale. Previous studies have shown that this expanded version has acceptable psychometric properties (Karatekin and Hill, 2019; Mersky et al., 2017).

The Pregnancy-Related Anxiety Questionnaire-20 (PRAQ-20) (Vázquez and Míguez, 2021) is the abbreviated Spanish version of the original Pregnancy-Related Anxiety Questionnaire-55 (PRAQ-55), (Van den Bergh, 1990), an instrument developed to assess specific fears and concerns associated with pregnancy. It is composed of 20 items distributed across five dimensions: fear of childbirth, concerns about fetal health, body image concerns, anxiety regarding the future and maternal role, and general pregnancy-related anxiety. Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating greater levels of pregnancy-related anxiety. Sample items include: "I am afraid that my baby will not be healthy" or "I am a little worried that our baby might be less attractive and I am afraid of the reactions of others." The PRAQ-20 has shown strong psychometric properties (Van den Bergh, 1990; Vázquez and Míguez, 2021), with an internal consistency coefficient of .91 in the present

sample.

The Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001) is a self-report instrument designed to assess the presence and severity of depressive symptoms. It consists of 9 items, each corresponding to one of the core symptoms of depression. Respondents are asked to rate how often they have been bothered by each symptom over the past two weeks using a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Total scores range from 0 to 27, with higher scores indicating greater depressive symptom severity. Example items include "You have had little interest or pleasure in doing things" or "You have had thoughts that you would be better off dead or of hurting yourself in some way". The PHQ-9 has demonstrated excellent psychometric properties (Kroenke et al., 2001) yielding an internal consistency coefficient of .82 within the present sample.

The Prenatal Self-Assessment Questionnaire (PSQ) (Armengol Asenjo et al., 2007) is the Spanish adaptation of a self-report instrument originally developed by Lederman (1996), designed to assess seven psychosocial dimensions relevant to pregnancy: (1) acceptance of pregnancy, (2) identification with the maternal role, (3) quality of relationship with the mother, (4) quality of relationship with the partner, (5) preparation for childbirth, (6) fear of pain and loss of control during labour, and (7) concerns about the well-being of both mother and baby. The questionnaire includes 42 items rated on a 4-point Likert scale ranging from 1 (never) to 4 (a lot). Examples of such items include "I wish I weren't pregnant" or "My husband reassures me when I feel overwhelmed." Higher scores reflect poorer adaptation to pregnancy. Items phrased positively are reverse coded before scoring to maintain consistency. The PSQ has shown strong reliability and validity in perinatal populations (Armengol Asenjo et al., 2007). In the present study, the questionnaire demonstrated acceptable internal consistency, with a Cronbach's alpha of .76.

Procedure

This study forms part of the research project entitled *El impacto de las experiencias infantiles adversas en el periodo perinatal y el desarrollo del primer año de vida del bebé: Un estudio longitudinal (PID2022-138634OBI00)*, which aims to understand how ACEs affect the prenatal mother's experience and the baby's development during the first year of life. Ethical approval was obtained from the Ethics Committee of the Hospital Universitario Puerta de Hierro Majadahonda (Research Ethics Committee on Medicinal Products), under approval number PI 203/23 and was pre-registered on the Open Science Framework (OSF; <https://osf.io/24wgz>).

Participants were recruited using a convenience sampling approach through the Obstetrics Department at Hospital Universitario Puerta de Hierro Majadahonda (Madrid), and via the research team's social media platforms from March 2024 to July 2025. Recruitment materials included informational posters featuring a QR code linking to a Google Forms platform, allowing interested individuals to submit their contact details. Following initial contact by email or telephone, participants received a comprehensive information sheet outlining the study's aims and procedures, along with a link to electronically sign the informed consent form. The consent process emphasised the voluntary nature of participation, the right to withdraw at any time, and measures to ensure confidentiality and anonymisation of data. Participants were encouraged to contact the research team with any questions prior to providing consent. To minimise potential sources of bias, the survey was administered anonymously online, questionnaires were presented in a fixed order, and no financial or material incentives were offered. Eligible participants completed an online structured prenatal assessment questionnaire via Qualtrics at any stage of pregnancy. Inclusion criteria required pregnant women aged 18 years or older, residing in Spain, who had experienced ACEs and provided informed consent. Women who delivered outside Spanish territory were excluded to ensure consistent and complete neonatal data collection.

Data analysis

Descriptive statistics were calculated for all study variables, and linear regression analyses were conducted using SPSS software. Hierarchical regression models were used to examine both the cumulative and differential impact of ACEs (traditional and expanded version) on pregnancy-related anxiety, depressive symptoms, and pregnancy adjustment. In both models, age and SES were entered in the first step as control variables, as previous research has demonstrated that maternal age (Zasloff et al., 2007) and socioeconomic status (Lancaster et al., 2010) are associated with prenatal mental health outcomes. This hierarchical approach allowed for the examination of the unique contribution of ACEs beyond these established sociodemographic factors. For cumulative impact (Table 2), the total number of traditional ACEs was added in the second step, followed by the total number of expanded ACEs in the third. For the differential impact (Table 3), specific traditional ACEs were entered in the second step, followed by specific expanded ACEs in the third. Prior to conducting the regressions, all dependent variables were assessed for normality using the Shapiro–Wilk test ($p > .05$), and regression assumptions of linearity, independence of residuals (Durbin–Watson 1.95–2.05), and homoscedasticity were satisfactorily met.

Results

Sample descriptive results

The initial sample comprised 330 pregnant women. Participants who did not complete the questionnaire in full or who withdrew from the study were excluded from the analysis using listwise deletion. As the survey was administered anonymously, detailed reasons for non-completion (e.g., withdrawal or technical difficulties) could not be recorded. Consequently, 306 women completed the questionnaire in its entirety. The final sample therefore consisted of 306 pregnant women (97.4% of Spanish nationality) aged between 22 and 46 years ($M = 34.69$, $SD = 3.91$), resulting in a response rate of 92.7%. An a priori power analysis was not conducted; the sample size was determined by feasibility, specifically the number of eligible participants who completed the online survey during the data collection period.

In terms of family context, nearly all participants (99%) reported having a partner. Regarding parity, more than half of the women (54.9%, $n = 168$) did not have any children apart from the current pregnancy. An additional 39.9% ($n = 122$) had one child, 3.9% ($n = 12$) had two, and 1.3% ($n = 4$) had three, indicating that the majority were either first-time mothers or had one prior child.

Health-related data showed that 11.8% ($n = 36$) of participants reported a physical illness, such as diabetes, cancer, or cardiovascular conditions. Additionally, 19.3% ($n = 59$) reported experiencing psychological difficulties, including symptoms of depression, anxiety, or obsessive thinking. Notably, 69.3% ($n = 212$) had previously received psychological therapy, indicating a substantial level of prior engagement with mental health services.

A smaller proportion of participants reported more severe psychosocial stressors: 5.9% ($n = 18$) experienced serious conflicts with their partner that threatened the stability of the relationship, 2% ($n = 6$) were experiencing physical or psychological violence from a partner or another individual, and 2.9% ($n = 9$) were involved in ongoing legal proceedings. Finally, regarding mental health outcomes, anxiety during pregnancy, ranged from 22 to 100, with a mean of 57.25 ($SD = 16.04$; $N = 306$). Scores on depressive symptoms during pregnancy, ranged from 0 to 27, with a mean of 6.05 ($SD = 4.22$; $N = 306$) and, maladjustment to pregnancy, ranged from 50 to 125, with a mean of 77.16 ($SD = 14.08$; $N = 306$).

ACEs descriptive results

As shown in Table 1, participants reported a variety of adverse experiences during childhood, based on the original ACE framework by Felitti et al. (1998) and expanded categories proposed by Mersky et al. (2017) and the World Health Organization (WHO) (2018).

Among the original ACE categories, the most frequently reported were the presence of mental illness in the household (41.2%, $n = 126$), emotional abuse (24.8%, $n = 76$), and physical abuse (21.9%, $n = 67$). Other experiences included parental divorce or separation (19.6%, $n = 60$), witnessing domestic violence (19.6%, $n = 60$), substance use in the household (17%, $n = 52$), and sexual abuse (14.1%, $n = 43$). Less common experiences were emotional neglect (10.1%, $n = 31$), physical neglect (2.6%, $n = 8$), and incarceration of a household member (2%, $n = 6$).

In the expanded ACE categories, parental absence (17.6%, $n = 54$) and financial hardship (16.0%, $n = 49$) were the most frequently reported. These were followed by the death of a family member or caregiver (13.1%, $n = 41$), unsafe neighbourhood conditions (5.9%, $n = 18$), and being a victim of violent crime (3.6%, $n = 11$). The least frequently endorsed item was homelessness during childhood (1.3%, $n = 4$).

Predictive analysis of cumulative effect of traditional and expanded ACEs

Then, three hierarchical regression analyses were conducted, as presented in Table 2, to examine the cumulative predictive value of traditional and expanded ACEs on prenatal anxiety, depressive symptoms, and pregnancy adaptation, while controlling for age and SES. For prenatal anxiety, only the inclusion of expanded ACEs in Step 3 significantly improved the model, $\Delta R^2 = .029$, $\Delta F(1, 290) = 11.76$, $p < .001$. Expanded ACEs emerged as a significant positive predictor ($\beta = .22$, $p < .001$), while traditional ACEs and control variables (age and SES) remained non-significant across all steps. Regarding depressive symptoms, traditional ACEs were a significant predictor in Step 2 ($\beta = .18$, $p = .002$), contributing to a significant model improvement, $\Delta R^2 = .021$, $\Delta F(1, 291) = 9.42$, $p = .002$. However, in Step 3, this association became non-significant, and expanded ACEs became the sole significant predictor ($\beta = .23$, $p < .001$). The addition of expanded ACEs in Step 3 significantly improved the model further, $\Delta R^2 = .037$, $\Delta F(1, 290) = 12.66$, $p < .001$. For pregnancy adaptation, both traditional ACEs ($\beta = .18$, $p = .022$) and expanded ACEs ($\beta = .15$, $p = .041$) significantly predicted greater maladjustment to pregnancy in the final model. Age also emerged as a significant positive predictor across all steps, with the strongest effect in Step 3 ($\beta = .18$, $p = .009$), suggesting that older

Table 1

Prevalence of traditional and expanded ACE categories.

ACE category	Prevalence % (n)
Traditional ACEs	
Emotional abuse	24.8% (76)
Physical abuse	21.9% (67)
Sexual abuse	14.1% (43)
Emotional neglect	10.1% (31)
Physical neglect	2.6% (8)
Divorce/separation	19.6% (60)
Domestic violence	19.6% (60)
Substance use in household	17% (52)
Mental illness in household	41.2% (126)
Family incarceration	2% (6)
Expanded ACEs	
Parental absence	17.6% (54)
Death of a parent or sibling	13.1% (41)
Unsafe neighbourhood	5.9% (18)
Victim of violent crime	3.6% (11)
Financial hardship	16% (49)
Homelessness	1.3% (4)

Note. ACE = Adverse Childhood Experiences; % = Reported rates of specific ACEs; n = Reported cases per specific ACE

Table 2
Linear regression of the cumulative effect of Traditional and Expanded ACEs on maternal mental health outcomes.

Step	Variables	Pregnancy-Related Anxiety (PRAQ)				Depression (PHQ)				Pregnancy maladjustment (PSQ)			
		B	SE	P	IC 95%	B	SE	P	IC 95%	B	SE	P	IC 95%
1	Age	-.32	.24	.193	[-.79; .16]	-.76	.06	.881	[-1.2; .14]	.01	.63	.017*	[-.11; 1.15]
	SES	-.83	1.71	.627	[-4.19; 2.53]	-.03	.45	.336	[-1.36; .45]	-.06	-2.89	.137	[-6.72; .93]
	R ²			.000				.004				.030	
2	Age	-.32	.24	.195	[-.79; .16]	-.08	.06	.856	[-.11; .14]	.01	.70	.006*	[-.19; 1.21]
	SES	-.81	1.71	.634	[-4.18; 2.55]	-.03	.45	.389	[-1.26; .49]	-.05	-2.39	.207	[-6.12; 1.34]
	R ²			.801	[-.89; 1.16]	.02	.14	.002*	[-.15; .69]	.18	1.92	<.001	[-.86; 2.98]
3	Age	-.30	.24	.202	[-.77; .16]	-.07	.06	.816	[-.12; .14]	.01	.67	.009*	[-.17; 1.17]
	SES	-.42	1.68	.801	[-3.73; 2.89]	-.02	.44	.524	[-1.14; .58]	-.04	-2.65	.161	[-6.35; 1.06]
	R ²			<.001*	[-1.94; .34]	-.09	.15	.271	[-1.31; .46]	.07	1.37	.022*	[-.19; 2.55]
	Traditional Total ACEs	.13	0.52	.801	[-1.47; 5.44]	.22	.26	<.001*	[-.42; 1.45]	.23	2.31	.041*	[-.09; 4.53]
	Expanded Total ACEs	3.46	1.01	.032				.062			1.12	.100	

Note. ACE = Adverse Childhood Experiences; SES = Socioeconomic Status; B = Regression coefficient; SE = Standard error; R² adjusted; *p ≤ 0.05; IC = Confidence interval; β = standardised beta.

pregnant women tend to experience greater difficulties adapting to pregnancy. SES did not significantly predict outcomes in any model.

Predictive analysis of differential effect of traditional and expanded ACEs

Hierarchical regression analyses examining the specific effects of traditional and expanded ACEs also revealed distinct patterns across psychological outcomes. For pregnancy-related anxiety, neither the control variables (Step 1) nor the traditional ACE categories (Step 2) significantly predicted anxiety symptoms. However, in Step 3, the addition of expanded ACEs significantly improved the model ($\Delta R^2 = .026, p = .010$). Specifically, experiencing an unsafe neighbourhood was a significant positive predictor of prenatal anxiety ($\beta = .16, p = .010$), while no traditional ACEs reached significance. In relation to depressive symptoms, Step 1 variables were non-significant. In Step 2, emotional neglect emerged as a significant predictor ($\beta = .20, p = .004$), contributing to a modest increase in explained variance ($\Delta R^2 = .032, p = .004$). This effect remained significant in Step 3 ($\beta = .19, p = .006$), and the inclusion of expanded ACEs again improved the model. Among the expanded ACEs, unsafe neighbourhood was also a significant positive predictor of depressive symptoms ($\beta = .18, p = .004$), indicating an additive effect. Regarding pregnancy maladjustment, age was a significant positive predictor at Step 1 ($\beta = .17, p = .017$), suggesting that older pregnant women reported more difficulties adjusting to pregnancy. SES was not a significant predictor at any step. In Step 2, physical abuse was significantly associated with poorer adaptation ($\beta = .18, p = .028$), and age remained significant ($\beta = .17, p = .014$). In Step 3, after including expanded ACEs, physical abuse increased in predictive strength ($\beta = .21, p = .012$), and parental absence also became a significant predictor ($\beta = .24, p = .002$), both associated with greater pregnancy adjustment difficulties. Age remained a consistent predictor ($\beta = .18, p = .010$). Notably, parental divorce or separation (a traditional ACE) was negatively associated with pregnancy adaptation ($\beta = -.19, p = .012$), indicating that women exposed to this experience reported better adjustment to pregnancy.

To enable a clearer comparison of effect sizes across outcomes, Fig. 1 presents the standardised regression coefficients for both traditional and expanded ACEs. Expanded ACEs showed stronger associations across all outcomes. Specifically, for pregnancy-related anxiety, only expanded ACEs were significant ($\beta = 0.22, p < .001$). For depressive symptoms, the inclusion of expanded ACEs also improved the final model ($\beta = 0.23, p < .001$). For pregnancy maladjustment, both traditional ($\beta = 0.18, p = .022$) and expanded ACEs ($\beta = 0.15, p = .041$) contributed significantly.

Discussion

This study examined whether integrating expanded ACEs, beyond the original framework by Felitti et al. (1998), improved the ecological validity and predictive power of ACE assessments for maternal mental health during pregnancy.

First, the prevalence of ACEs in our sample was consistent with previous research in perinatal populations (Foti et al., 2023). Specifically, the prevalence pattern of traditional ACEs in our sample was comparable to that reported in previous studies, with emotional abuse emerging as the most frequently reported adversity, followed by household dysfunctions such as household mental illness or parental divorce (Merrick et al., 2018). Among expanded ACEs, parental absence (17.6%) and financial hardship (16%) were the most frequently reported, consistent with findings from Mersky et al. (2017). These comparable rates support the representativeness of our sample and further highlight the importance of assessing both traditional and expanded ACEs when examining maternal mental health during the perinatal period.

Additionally, the findings supported our first hypothesis, indicating that expanded ACEs provided incremental predictive value beyond traditional ACEs. Notably, expanded ACEs were significantly associated

Table 3
Linear regression of the specific effect of traditional and expanded ACEs on maternal mental health outcomes.

Step	Variables	Pregnancy-Related Anxiety (PRAQ)					Depression (PHQ)					Pregnancy maladjustment (PSQ)					
		B	SE	p	IC	β	B	SE	p	IC	β	B	SE	p	IC	β	
1	Age	-.32	.24	.193	[-.79; .16]	-.08	.01	.06	.881	[-.12; .14]	.01	.63	.26	.017*	[.11; 1.15]	.17	
	SES	-.83	1.71	.627	[-4.19; 2.53]	-.03	-.44	.45	.336	[-1.33; .45]	-.06	-2.89	1.94	.137	[-6.72; .93]	-.10	
	R ²			.000					.004					.030			
2	Age	-.38	.25	.134	[-.87; .12]	-.09	.01	.06	.934	[-.12; .13]	.01	.65	.26	.014*	[.13; 1.16]	.17	
	SES	-.66	1.74	.705	[-4.09; 2.77]	-.02	-.32	.45	.495	[-1.19; .58]	-.04	-1.67	1.91	.382	[-5.44; 2.09]	-.06	
	<i>Traditional ACE Categories</i>																
	Emotional abuse	-.01	2.84	.996	[-5.61; 5.59]	.00	1.17	.73	.111	[-.27; 2.61]	.12	4.94	2.91	.091	[-.79; 10.68]	.15	
	Physical abuse	.10	2.84	.971	[-5.49; 5.69]	.01	-.12	.73	.872	[-1.56; 1.32]	-.01	6.09	2.75	.028*	[.66; 11.53]	.18	
	Sexual abuse	-1.82	2.80	.510	[-7.36; 3.67]	-.04	.08	.72	.909	[-1.34; 1.49]	.01	5.49	2.88	.058	[-.18; 11.17]	.13	
	Emotional neglect	1.12	3.72	.767	[-6.22; 8.43]	.02	2.78	.96	.004*	[.90; 4.67]	.20	5.09	3.77	.178	[-2.34; 12.53]	.11	
	Physical neglect	5.24	6.65	.431	[-7.85; 18.34]	.05	-2.87	1.71	.094	[-6.29; .49]	-.11	-1.31	6.42	.839	[-13.97; 11.35]	-.02	
	Divorce/separation	-2.98	2.57	.248	[-8.04; 2.09]	-.07	-.29	.66	.656	[-1.59; 1.01]	-.03	-4.82	2.64	.069	[-10.03; .38]	-.13	
	Domestic violence	.85	2.89	.769	[-4.85; 6.55]	.02	.18	.74	.808	[-1.28; 1.65]	.02	-2.49	2.90	.392	[-8.21; 3.23]	-.07	
	Substance use in household	-1.39	2.78	.616	[-6.86; 4.08]	-.03	.34	.71	.633	[-1.06; 1.75]	.03	3.31	2.75	.230	[-2.11; 8.72]	.09	
	Mental illness in household	1.65	2.11	.435	[-2.50; 5.81]	.05	.37	.54	.494	[-.69; 1.44]	.04	.23	2.08	.912	[-3.88; 4.34]	.01	
	Family incarceration	-2.92	6.99	.677	[-16.68; 10.85]	-.02	.55	1.79	.768	[-2.98; 4.09]	.02	-.46	8.34	.956	[-16.91; 15.99]	-.01	
	R ²			.022					.036					.115			
	3	Age	-.30	.25	.230	[-.80; .19]	-.07	.03	.06	.680	[-.10; .16]	.02	.68	.26	.010*	[.17; 1.19]	.18
		SES	-.29	1.76	.867	[-3.75; 3.16]	-.01	-.28	.45	.541	[-1.17; .61]	-.04	-1.48	1.93	.444	[-5.28; 2.32]	-.05
		<i>Traditional ACE Categories</i>															
Emotional abuse		-.80	2.84	.777	[-6.39; 4.78]	-.02	1.04	.73	.107	[-.39; 2.48]	.12	4.59	2.94	.121	[-1.22; 0.39]	.14	
Physical abuse		-.17	2.91	.954	[-5.89; 5.55]	-.01	-.23	.75	.761	[-1.7; 1.25]	-.02	7.26	2.87	.012*	[1.59; 12.94]	.21	
Sexual abuse		-2.23	2.80	.426	[-7.75; 3.28]	-.05	.07	.72	.918	[-1.35; 1.49]	.01	4.73	2.89	.103	[-.97; 10.43]	.11	
Emotional neglect		.16	3.74	.976	[-7.19; 7.51]	.00	2.66	.96	.006*	[.76; 4.55]	.19	2.92	3.82	.445	[-4.62; 10.47]	.06	
Physical neglect		6.29	6.72	.350	[-6.93; 19.51]	.06	-2.79	1.73	.108	[-6.19; 62]	-.12	-.43	6.81	.949	[-13.87; 12.35]	-.01	
Divorce/separation		-4.72	2.74	.086	[-10.12; .67]	-.12	-.51	.71	.468	[-1.9; .88]	-.05	-6.93	2.75	.012*	[-12.35; -1.51]	-.19	
Domestic violence		-.09	3.03	.974	[-6.07; 5.87]	-.00	.08	.78	.922	[-1.46; 1.62]	.01	-4.62	3.01	.127	[-10.57; 1.32]	-.13	
Substance use in household		-2.07	2.79	.460	[-7.57; 3.44]	-.05	.19	.72	.794	[1.23; 1.61]	.02	3.86	2.76	.164	[-1.59; 9.32]	.11	
Mental illness in household		1.81	2.11	.393	[-2.35; 5.97]	.056	.37	.55	.504	[-.71; 1.44]	.04	.71	2.08	.733	[-3.39; 4.82]	.03	
Family incarceration		-4.72	7.23	.514	[-18.95; 9.49]	-.04	.55	1.86	.768	[-3.12; 4.21]	.02	1.14	8.34	.891	[-15.31; 17.6]	.01	
<i>Expanded ACE Categories</i>																	
Parental absence		3.09	2.87	.283	[-2.57; 8.75]	.07	.23	.74	.761	[-1.23; 1.68]	.02	9.69	3.13	.002*	[3.53; 15.86]	.24	
Death of a parent or sibling		3.28	2.96	.269	[-2.54; 9.09]	.07	.33	.76	.664	[-1.17; 1.83]	.02	-2.56	3.39	.452	[-9.25; 4.13]	-.05	
Unsafe neighbourhood		11.09	4.31	.010*	[2.62; 19.57]	.16	3.25	1.11	.004*	[1.07; 5.43]	.18	-5.59	4.82	.247	[-15.09; 3.92]	-.09	
Victim of violent crime	-1.84	5.73	.749	[-13.11; 9.44]	-.02	-.93	1.48	.531	[-3.83; 1.98]	-.04	2.42	9.69	.804	[-16.72; 21.55]	.02		
Financial hardship	.89	3.07	.772	[-5.16; 6.94]	.02	.09	.79	.910	[-1.47; 1.65]	.01	-.48	3.10	.877	[-6.60; 5.64]	-.01		
Homelessness	3.98	8.77	.650	[-13.39; 21.25]	.03	.53	2.26	.814	[-3.92; 4.98]	.01	4.69	15.55	.763	[-25.99; 35.37]	.02		
R ²			.004					.048					.138				

Note. ACE = Adverse Childhood Experiences; SES= Socioeconomic Status; B = Regression coefficient; SE = Standard error; R² adjusted; * p ≤ 0.05; IC = Confidence interval; β = standardised beta.

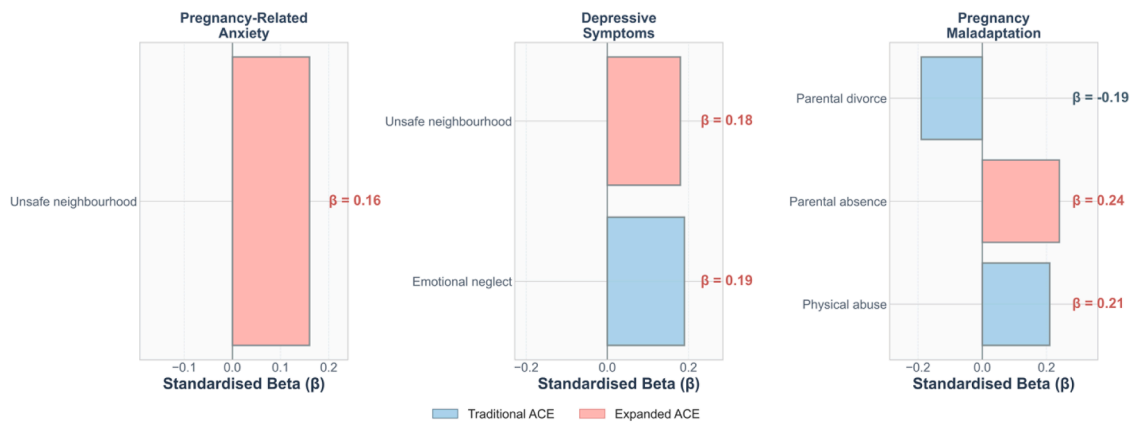


Fig. 1. Differential effects of traditional and expanded ACEs on maternal mental health outcomes. **Note.** Specific ACEs were significantly associated with maternal mental health outcomes. Standardised regression coefficients (β) are from final hierarchical models controlling for age and SES. Traditional ACEs are shown in blue; expanded ACEs in coral. All coefficients are significant at $p < .05$. A negative coefficient for parental divorce indicates better pregnancy adaptation.

with all assessed maternal mental health outcomes. With regard to pregnancy-related anxiety, expanded ACEs showed a unique association with elevated symptom levels. This relationship may be explained by the chronic, unpredictable, and externally driven nature of many expanded adversities (such as exposure to community violence, discrimination, or economic insecurity) which are known to heighten stress sensitivity and physiological arousal over time (Evans and Kim, 2007; Whitman et al., 2022). During pregnancy, a period marked by significant physical and emotional changes, these early experiences may resurface as a heightened sense of threat, uncertainty, or lack of control, thereby intensifying anxiety symptoms and emotion dysregulation (Hill et al., 2005).

Regarding depression, while traditional total ACEs were initially associated with prenatal depressive symptoms, this effect disappeared once expanded ACEs were included in the model. This suggests that broader socio-environmental adversities may provide greater explanatory power for depressive symptoms in pregnant women, potentially due to their ongoing relevance and impact on access to support and coping resources. An explanation may lie in the enduring relevance of these forms of adversity across the life course. Such experiences can significantly impact women's current access to emotional, social, and material resources (Ennis et al., 2000), thereby weakening their ability to cope during the perinatal period and increasing susceptibility to low mood and feelings of hopelessness.

For pregnancy adaptation, both traditional and expanded ACEs jointly predicted pregnancy maladjustment, highlighting the complex and cumulative impact of early adversity on maternal adjustment (Özşahin, 2020; Souch et al., 2022). Traditional ACEs may influence internal working models related to attachment, trust, and self-worth, which are foundational for forming a maternal identity (Bowlby, 1973; Murphy et al., 2014). In contrast, expanded ACEs often reflect ongoing psychosocial stressors that may amplify emotional strain during the transition to motherhood, making it harder for women to adjust to the demands of pregnancy (Crockenberg and Leerkes, 2003).

Our second hypothesis posited that specific ACEs, both traditional and expanded, would differentially predict maternal mental health outcomes, offering direction for more targeted prevention and intervention efforts. The results supported this, revealing distinct predictive patterns consistent with established psychological theories. Notably, expanded ACEs were particularly salient in relation to prenatal anxiety and depression, underscoring the psychological burden of adversities extending beyond the family unit. Among these, perceived neighbourhood unsafety emerged as a strong predictor of both conditions, illustrating the enduring influence of community-level stressors on maternal well-being. These findings align with prior evidence that chronic exposure to threatening, or unstable environments elevates stress reactivity and impairs emotion regulation, thereby increasing susceptibility to

mood and anxiety disorders (Heim et al., 2008; Hughes et al., 2017; Racine et al., 2018). In such settings, unpredictability, and lack of control, common in disadvantaged communities, can elicit heightened vigilance, persistent worry, and rumination (Diez Roux and Mair, 2010; Latkin and Curry, 2003). These stress responses are amplified during pregnancy, a time marked by increased emotional sensitivity and anticipatory concerns, especially in the absence of buffering resources such as social support, financial security, or safe public spaces.

In the case of depression, emotional neglect, alongside neighbourhood insecurity, stood out as a key predictor, pointing to adverse influences from both familial and environmental domains that may converge through complementary psychological pathways. Emotional neglect may hinder the development of secure attachment and emotion regulation skills (Bowlby, 1973; Glickman et al., 2021), deficits that can resurface during pregnancy as interpersonal needs and self-perceptions become especially salient. Simultaneously, ongoing exposure to unsafe neighbourhoods may foster a sense of helplessness and unpredictability, resonating with the learned helplessness model (Miller and Seligman, 1975). Bronfenbrenner's socio-ecological framework (1979) provides further context by illustrating how broader structural conditions shape individual mental health outcomes. In such environments, limited access to psychosocial resources may heighten feelings of isolation and reduce coping capacity during this already vulnerable period (Ennis et al., 2000).

Building on this, the findings regarding maladjustment to pregnancy suggest that both early interpersonal trauma and broader contextual factors play a critical role in shaping how women adjust to the psychosocial demands of the perinatal period. Specifically, maternal age, physical abuse, parental absence, and, counterintuitively, parental divorce or separation emerged as significant predictors of adaptation difficulties. Physical abuse, a traditional ACE, could disrupt the development of essential psychological capacities such as emotion regulation, self-efficacy, and relational security (Afifi et al., 2012). The lasting impact of such trauma may undermine a woman's confidence in her ability to care for both herself and her unborn child, particularly amidst the physical and emotional changes of pregnancy. Similarly, parental absence, an expanded ACE, often entails a lack of consistent emotional and practical support during critical developmental periods. From a developmental perspective, growing up without a stable parental figure can impair the ability to trust others and foster chronic emotional insecurity, which may reduce psychological readiness for motherhood and increase vulnerability to prenatal maladjustment (Ososky et al., 2021).

Maternal age also emerged as a significant factor, with older women reporting greater difficulty adjusting to pregnancy. While advanced maternal age is often associated with increased emotional maturity and

life experience, it may also bring more complex psychosocial challenges. Older expectant mothers are more likely to encounter career-related pressures, heightened health concerns, and histories of infertility or pregnancy loss, factors that have been linked to elevated prenatal anxiety and reduced psychological flexibility (Bayrampour et al., 2015). Consistent with this, previous research has found that women of advanced maternal age tend to express greater concern about fetal health and pregnancy outcomes, reflecting a heightened sense of vulnerability during the perinatal period (Fisher et al., 2013; Gavin et al., 2011; Lamminpää, 2015).

Interestingly, parental divorce or separation was associated with better psychological adaptation to pregnancy. Although this may seem paradoxical, it could reflect situations in which the dissolution of a high-conflict family environment leads to a more stable and emotionally secure setting for the child. In such contexts, individuals may develop adaptive coping strategies and resilience, which subsequently support emotional adjustment during adulthood, including through significant life transitions such as parenthood. This pattern aligns with previous findings in the Spanish context (Villanueva and Gomis-Pomares, 2021), who reported similar counterintuitive associations between parental divorce and substance use in emerging adulthood. Similar findings have been reported in other studies, who all highlight the complex and sometimes counterintuitive effects of adverse experiences on behaviours such as substance use, truancy, and smoking (Barrera et al., 2016; Mersky et al., 2017; Sharp et al., 2012).

Despite its strengths, this study has some important limitations to consider. First, its cross-sectional design limits the ability to draw causal inferences about whether ACEs directly contribute to maternal mental health difficulties during pregnancy. Second, ACEs measure is limited by its restricted coverage, reliance on retrospective self-report, and the challenge of combining heterogeneous adversities into a single cumulative score, which should be considered when interpreting associations with maternal mental health and in future replication studies. In addition, participants were recruited via the hospital's Obstetrics Department and the research group's social media, which may have led to self-selection bias. Those who participated might differ in willingness to disclose sensitive information or engagement with healthcare, potentially limiting the generalisability of findings on the impact of ACEs on maternal mental health. Third, the use of dichotomous scoring for both traditional and expanded ACEs, while consistent with established practice, may overlook differences in the severity, frequency, or duration of adverse experiences. Additionally, analyses examining multiple specific ACE categories, particularly those with low prevalence, may have been underpowered to detect small effects, increasing the risk of Type II error. Furthermore, conducting multiple analyses simultaneously could elevate the risk of Type I error, so nonsignificant and significant findings alike should be interpreted with caution. However, the number of variables included in the regression was determined according to the maximum recommended based on the study's sample size, with a minimum subject-to-predictor ratio ranging from 15:1 to 25:1 (Green, 1991; Schmidt, 1971), to ensure stable estimates and adequate statistical power. Fourth, gestational age or trimester was not recorded, limiting the ability to account for variations in maternal mental health across pregnancy; future studies should include this information to capture stage-specific effects. In addition, the sample was characterised by relatively high socioeconomic status and educational attainment, which may limit the generalisability of these findings to populations with lower socioeconomic status or different educational backgrounds. Previous research has shown that the impact and prevalence of ACEs can vary across socioeconomic strata (Swedo, 2023), and the associations observed in our sample may not fully capture the experiences of women from more socioeconomically disadvantaged contexts. Furthermore, the study did not include a priori power analysis, and the sample size was determined by feasibility rather than statistical considerations. This limitation may restrict the ability to detect small effect sizes and limit the generalisability of the findings. Finally,

although the study assessed psychological symptoms and pregnancy adaptation, it did not include protective factors such as resilience, coping strategies, or social support, which could moderate the impact of ACEs. Similarly, current life stressors and psychosocial context, such as recent stressful events or relationship quality, were not included in the analyses and may also moderate the impact of ACEs on maternal mental health. The absence of these measures introduces potential confounding, as current circumstances may partially account for the observed associations between ACEs and mental health outcomes. Incorporating these variables in future research would offer a more comprehensive understanding of how early adversity shapes perinatal outcomes.

Conclusion

Despite limitations, including the cross-sectional design and potential confounding from unmeasured current stressors this study provides preliminary evidence for the importance of adopting an expanded and contextually grounded understanding of ACEs in perinatal mental health. Findings revealed that expanded ACEs, were uniquely associated with pregnancy-related anxiety, while traditional ACEs lost their predictive value for depression when expanded forms were considered, suggesting that broader ecological factors may offer greater explanatory power. The combination of traditional and expanded ACEs predicted greater maladjustment to pregnancy, with specific contributions from older maternal age, physical abuse, parental absence, and, counterintuitively, parental divorce, reflecting unresolved emotional complexities. These findings highlight the multifaceted nature of prenatal psychological distress and have important clinical implications. Healthcare professionals should incorporate both traditional and expanded ACEs into routine screening, develop context-sensitive and trauma-informed interventions, and tailor support to the distinct needs of women with varied adversity profiles, including those of advanced maternal age. Beyond individual clinical practice, these findings carry policy implications. The association between neighbourhood safety and maternal mental health underscores the need for community-level interventions that extend beyond healthcare settings. Policymakers should prioritise initiatives improving neighbourhood safety, accessible social services, and residential quality, particularly in disadvantaged areas. Policies addressing financial hardship and parental absence, such as paid parental leave and childcare support, alongside trauma-informed public health approaches and equitable mental health access, are essential for reducing disparities and promoting intergenerational well-being. By integrating a life-course, socio-ecological perspective into perinatal care, clinicians and researchers can more effectively identify at-risk women, inform targeted interventions, and work towards disrupting intergenerational cycles of trauma.

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Ethics approval

This study was approved by the Research Ethics Committee on Medicinal Products (*Comité de Ética de Investigación con Medicamentos*) of the Hospital Universitario Puerta de Hierro Majadahonda (Minutes No. 19/2023; Internal Code: PI 203/23).

Consent to participate

Informed consent was obtained from all participants involved in the study, in accordance with the principles of the Declaration of Helsinki and applicable data protection laws.

Data availability

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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

During the preparation of this work, the authors used ChatGPT (OpenAI) solely to assist in reviewing the English language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

CRedit authorship contribution statement

Aitana Gomis-Pomares: Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **María Cantero-García:** Writing – review & editing, Funding acquisition, Data curation, Conceptualization. **Renata Sarmiento-Henrique:** Writing – review & editing, Methodology, Funding acquisition, Data curation. **Sandra Doval:** Writing – review & editing, Writing – original draft, Supervision, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no competing interests relevant to the content of this article.

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