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Acculturative stress, telomere length, and postpartum depression in Latinx mothers

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ABSTRACT

Latinx mothers in the United States are highly vulnerable to psychosocial stressors, including discrimination and acculturative stress, which increase maternal health risks. Previous work in Latinx mothers indicates that prenatal discrimination influences epigenetic immune markers that may increase risk for postpartum depression. Discrimination and acculturative stress have also been linked to cellular aging, including telomere degradation, in Hispanic populations broadly, but not in this particularly vulnerable population. The present work addressed this gap in a sample of 150 Latinx mothers living in the United States (mean age 27.6 years). Psychosocial measures (including discrimination, stress, and mental health) and blood were collected at 24–32 weeks gestation. Psychosocial measures were re-evaluated at 4–6 weeks postpartum. First, we examined the relationship between maternal prenatal cultural stress (i.e., discrimination and acculturative stress) and telomere length (TL). Second, we tested whether TL predicted postpartum depression. Acculturative stress – but not discrimination – predicted shorter TL, especially among participants with high methylation of the *FOXP3* promoter region. Further, shorter telomere measures during pregnancy predicted greater postpartum depression symptom severity. TL was not related to any sociodemographic characteristics such as age, income, country of origin, or years in the United States. These results highlight the uniquely impactful role of acculturative stress on Latinx maternal health and the potential interactive role of telomere length and epigenetic immune alterations in risk for maternal mental health concerns.

1. Introduction

Latinx individuals living in the United States are especially vulnerable to experiencing stress and negative health outcomes related to acculturation, which is the process of adapting one's beliefs and behaviors to the host culture (Lara et al., 2005). In Latinx communities in the United States, acculturative stress, the psychological impact of this adaptation process (Smart and Smart, 2016), results from multiple stressful changes. These include environmental (e.g., language barriers, financial struggles), social (e.g., loss of community, family conflict), and societal (e.g., discrimination, stigma) stressors (Caplan, 2007). The burden of acculturative stress not only promotes poor physical and mental health in Latinx populations (Caplan, 2007; Smart and Smart, 2016), it may also mediate the relationship between discrimination and psychological distress (Torres et al., 2012).

This is troubling during any life phase, but especially so in the context of the preparation for and the transition to motherhood. Acculturative stress is related to depression and anxiety symptoms during pregnancy (D'Anna-Hernandez et al., 2015; Preciado and D'Anna-Hernandez, 2017) and is a consistently documented cultural stress that increases risk for postpartum depression in Latinx mothers (Alhasanat and Giurgescu, 2017; Lara-Cinisomo et al., 2016). This risk may even extend throughout the childrearing experience. For instance, in one study assessing economic hardship and cultural stressors – including discrimination and acculturative stress – in Latinx mothers (*n* = 169) with adolescent children, these psychosocial stressors predicted greater maternal depressive symptoms (Hill et al., 2019). Moreover,

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acculturative-based family conflict, specifically, predicted depressive symptoms over and above the role of other stressors in their surrounding communities.

Acculturative stress also appears to disrupt family functioning over years. For instance, a study of foreign-born Latinx individuals found that acculturative stressors – namely involuntarily exiting the country of origin, hostile reception in the new country, and limited ties with the country of origin – were associated with lower familialism and greater familial conflict (Bostean and Gillespie, 2018). Similarly, in a sample composed predominately of Latinx mothers (74%), parental acculturative stress was associated with worse family functioning, and this was especially so when acculturative stress increased over time (Lorenzo-Blanco et al., 2016). These findings are concerning considering that positive family functioning is an important factor that may buffer against youth risk-taking behavior.

Broadly speaking, psychosocial stress not only affects mental health but can also alter physiological markers of health and well-being. One prime example is telomere length (TL), which indexes cellular aging and is sensitive to exposure to stress, especially the cumulative effect of long-term chronic stressors (Epel et al., 2004; Mathur et al., 2016). Telomere shortening has been associated with immune senescence and increased risk of age-related diseases (Vaiserman and Krasnienkov, 2021). The effect of psychosocial stress and discrimination on TL appears to differ based on race/ethnicity and age and their interactions. For instance, in a diverse sample of 981 participants, Black and Hispanic individuals had shorter telomeres than White individuals. Interestingly, Black and Hispanic participants also displayed greater age-related differences in TL than White individuals (Diez Roux et al., 2009). Moreover, these disparities were quite pronounced in women; six times greater in Black and Hispanic women compared to White women.

TL also appears to be specifically relevant in the maternal-child health context. In a sample of Mexican American mothers ($n = 56$), acculturation (indexed by both Anglo orientation and level of acculturation) negatively predicted TL (Ruiz et al., 2017). In another study, acculturative stress and resultant excessive weight gain was assessed in low-income Mexican mothers ($n = 108$). Among those mothers with greater acculturation to the United States, TL was negatively associated with body fat percentage, suggesting an integrated role of psychosocial stress and TL in maternal obesity risk (Aguayo et al., 2021). In a sample of economically disadvantaged Latinx children across the United States ($n = 417$), exposure to material hardships, specifically medical and financial difficulties, was significantly related to shorter TL (Niño, 2021).

Our previous work has documented the relationship between psychosocial stress and both biological (e.g., epigenetic alterations of immune-regulatory genes) and mental health (e.g., depression and anxiety) indicators in a sample of pregnant Latinx mothers (Santos et al., 2021; Sluiter et al., 2020). In this prior work, discrimination was most strongly associated with prenatal depression symptom severity, but acculturative stress was also related to depression and anxiety symptoms (Santos et al., 2021). We also recently reported associations between epigenetic markers of inflammation and depression and anxiety as predicted by everyday discrimination (Sluiter et al., 2020). Namely, prenatal discrimination predicted postnatal depression and anxiety symptoms among those with high *FOXP3* Treg-cell-specific-demethylation region (TSDR), a marker of adaptive inflammatory regulation. Additionally, this relationship was mediated by methylation of the promoter gene for TNFα, a pro-inflammatory cytokine, implying that immunoregulation via TNFα promoter methylation may buffer the impact of discrimination stress on postpartum depression symptomatology. These findings suggest a role for epigenetic markers of immunoregulation and inflammation in the resilience or sensitivity to prenatal stress.

The objective of the present study was to examine associations between psychosocial stressors and TL and whether TL predicts sensitivity to stress and severity of postnatal depression symptoms in Latinx mothers. We first investigated the longitudinal association between TL and postnatal mental health, hypothesizing that shorter prenatal TL would predict greater postnatal depression severity scores. Secondly, we investigated psychosocial factors associated with TL, hypothesizing that sociodemographics (such as maternal age and income) and social stressors (such as higher experiences of perceived discrimination and acculturative stress) would be related to shorter TL. Finally, given the interrelatedness of TL and immune function and of immune function and stress, we tested for a possible moderating role of epigenetic immune markers, namely *FOXP3* TSDR.

2. Materials and methods

2.1. Participants

A sample of healthy pregnant Latinx women living in North Carolina ($n = 150$) were enrolled in the study between May 2016–March 2017. Eligibility criteria were the following: 18–45 years of age, Spanish or English speaker, carrying a singleton pregnancy (i.e., not pregnant with twins or multiples), available for follow-up at 6 weeks post-delivery. Exclusion criteria were the following: currently experiencing severe depressive symptoms as determined by the Mini International Neuropsychiatric Interview (Sheehan et al., 1998), currently taking medication for depression, history of bipolar or psychotic disorder, currently receiving psychotherapy, history of substance abuse in the past two years, documented fetal anomaly, or life-threatening conditions. These exclusion criteria were selected to avoid potential confounding variables and to control for severe mood symptoms with onset before the study timeframe. Interviews were conducted by a trained research assistant in English or Spanish based upon each participant's preference.

Data were collected during two study visits: a prenatal visit at 24–32 weeks gestation and a postpartum visit 4–6 weeks after giving birth. These times will be referred to as the prenatal and postnatal visits, respectively. At the prenatal visit, severity of depressive symptoms and psychosocial stress were measured, and blood specimens were collected. Depressive symptoms and psychosocial stress were reassessed at the postnatal visit. The measures included in this study had validated versions in English and Spanish. The Institutional Review Board of the University of North Carolina at Chapel Hill approved this study (#15–3027).

2.2. Depressive symptom severity – prenatal and postnatal visits

The Edinburgh Postnatal Depression Scale (EPDS) was used to identify women who may have had perinatal and/or postpartum depression symptoms (Cox et al., 1987). The EPDS scale consists of 10 self-report items where respondents select how frequently common depressive symptoms have occurred over the previous week. Each answer is given a score of 0–3 with a maximum score of 30.

2.3. Psychosocial stress – prenatal and postnatal visits

2.3.1. Acculturation

During the prenatal visit, the 24-item Bidimensional Acculturation

Scale (BAS) was used to measure acculturation (Marín and Gamba, 2016). The BAS assesses the degree to which individuals participate in the cultural domains of both the culture of origin and the culture of contact. The BAS includes items related to both Hispanic and Non-Hispanic cultural domains and includes three subscales: language use (6 questions), language proficiency (12 questions), and electronic media (6 questions). The BAS asks participants to report the frequency with which they experience events or their ability to use technology on a 1–4 Likert scale, with higher scores indicating higher frequency or better ability (1 = Almost Never to 4 = Very Well). An overall acculturation score as well as subscales for both Hispanic and Non-Hispanic domains were used in this study.

2.3.2. Acculturative stress

At the prenatal and postnatal visits, the 9-item Acculturative Stress Scale was used to assess experiences with the acculturation process (Gil et al., 1994) including how well participants adapted to changes, some of which were not under their control. The scale measures the frequency of certain emotions and experiences regarding acculturation to the US in the past year on a Likert scale of 1–5 (1 = Not at All to 5 = Almost Always). Sample questions include "How often do you feel that you would rather be more American if you had a choice?" and "How often do you feel uncomfortable having to choose between non-Hispanic/Latino and Hispanic/Latino ways of doing things?". Responses were summed across the items, with higher scores indicating a greater degree of acculturative stress.

2.3.3. Discrimination

At both the prenatal and postnatal visits, the 9-item Everyday Discrimination Scale (EDS) was used to measure typical day-to-day experiences of discrimination. The EDS is a common measure of the subjective experience of discrimination (Campo-Arias et al., 2015; Park et al., 2018; Williams et al., 1997). The EDS asks participants to rate the frequency with which they experience discriminatory events in their daily life on a 0–5 Likert scale (0 = Never to 5 = Almost Every Day). Sample questions include: "you are treated with less courtesy than other people are" and "people act as if they are afraid of you." The EDS does not prompt individuals to think about race, which can impact prejudice-related cues on responses (Deitch et al., 2003). Therefore, in addition to rating the frequency of the discriminatory experiences, participants were then asked for their perception of the main reason for these experiences, which included specific rationales including ethnicity, gender, race, age, religion, height or weight, physical appearance, sexual orientation, education, income level, or other types of discrimination.

2.4. DNA collection, methylation and TL – prenatal visit

As previously described (Santos et al., 2018), a 6 mL blood sample was collected prenatally followed by self-report measures in order to reduce potential variability in the stress response. The buffy coat was separated by centrifugation, frozen on dry ice, and stored at − 80 °C at the University of North Carolina Biobehavioural Lab for DNA extraction. DNA extraction was conducted with the QIAamp DNA Blood Mini Kit into individual cryovials and stored at − 80 °C. The extracted DNA was transported on dry ice to Manchester University for DNA methylation analysis. DNA methylation at the *FOXP3* promoter region was performed and previously described (Sluiter et al., 2020).

A second aliquot of whole blood was extracted for genomic DNA using the QIAamp DNA kit (Catalog No 56504). Average TL was determined using the ScienCell Absolute Human Telomere Length Quantification (AHTLQ) qPCR assay kit (Catalog No 8918) according to the manufacturer's instructions. Specifically, the telomere primers recognize and amplify telomere sequences, and the single copy reference (SCR) primers recognize and amplify a 100bp-long region on human chromosome 17, serving as reference for data normalization. Reference genomic DNA with known TL was used as a reference for calculating the absolute TL of target samples. Two consecutive qPCR reactions were set for each target DNA sample, one to amplify the telomere sequence and the other to amplify the SCR sequence. Both qPCR reactions were performed in a final reaction volume of 10 μL, which includes 2 μL of target or reference genomic DNA, 1 μL of primer stock solution, 5 μL of 2X qPCR GoldNStart TaqGreen master mix, and 2 μL of nuclease-free water. The PCR conditions are as follows: initial denaturation at 95 °C for 10 min followed by 32 cycles of 95 °C for 20 s, 52 °C for 20 s and 72 °C for 45 s. Average TL values normalized to the reference human genomic DNA were calculated.

2.5. Statistical analyses

A series of linear regression analyses were performed to test associations among psychosocial stress, average TL, and maternal mental health. First, average TL was tested as a continuous predictor of EPDS scores. Differences in TL were then tested based on various sociodemographic factors using tertile values to characterize the range of TL values (cutoffs set at average TL of 3.699 and 6.176). In addition, separate linear regression analyses were conducted to test various psychosocial stressors as continuous predictors of TL. Finally, in line with previous work on epigenetic markers of immune function in this dataset (Sluiter et al., 2020), the sample was stratified according to *FOXP3* methylation, and psychosocial stress was tested as a continuous predictor of TL in high versus low methylation groups. Specifically, participants were stratified according to *FOXP3* methylation above or below the mean of 88.77. Despite typical associations between TL and age, maternal age was not significantly correlated with TL, $r(149) = -0.07$, $p = .395$, *FOXP3* methylation, $r(148) = .09$, $p = .281$, or postnatal depression, $r(141) = -0.05$, $p = .529$. Therefore, to preserve parsimony, age was not included in any models. All analyses were completed in SPSS V28 software. Statistical significance was determined at alpha < .05.

3. Results

3.1. Maternal postnatal mental health and TL

TL was a significant negative predictor of postpartum EPDS scores (b = −0.24, *SE* = 0.11, $\beta = -0.19$, $p = .024$). This was observed over and above the effect of prenatal EPDS scores, suggesting a unique role of TL in risk for postnatal depression symptom severity. Additionally, there was no cross-sectional association between TL and prenatal EPDS scores (b = 0.07, *SE* = 0.01, $\beta = .06$, $p = .469$).

3.2. Sociodemographic factors and TL

There were no significant differences in TL based on ethnicity (US born or non-US born), spoken language (English or Spanish), income, welfare status, education, or marital status (all p's > 0.110). See Table 1 below for percentage breakdowns by TL tertile. Other factors that could be related to TL include gestational diabetes and smoking status. However the prevalence of these indicators in our cohort were not powered sufficiently to be tested ($n = 16$ and 3, respectively).

3.3. Prenatal psychosocial factors and TL

Because psychosocial stress and discrimination have been demonstrated as strong predictors of EPDS scores in this cohort (Sluiter et al., 2020), we tested their effects on TL as well. Total BAS score did not predict TL (b = 0.52, *SE* = 0.52, $\beta = .08$, $p = .316$). However, the Hispanic domain showed a negative association (b = −0.87, *SE* = 0.47, $\beta = -0.15$, $p = .068$) with TL as compared to the non-Hispanic domain, which showed a positive association (b = 0.46, *SE* = 0.24, $\beta = .16$, $p = .059$). That is, higher scores on the Hispanic domain predicted shorter

Table 1
Sociodemographic characteristics and psychosocial scores overall and by TL tertile.

	Overall	Tertile 1	Tertile 2	Tertile 3
Ethnicity				
Non-US Born	84%	89.8%	86%	76%
US Born	16%	10.2%	14%	24%
Language				
English	21.3%	16.3%	16%	32%
Spanish	78.7%	83.7%	84%	68%
Total Income Category				
Less than $15,000	39.3%	34.7%	34%	50%
$15,000 - $19,999	23.3%	28.6%	24%	18%
$20,000 - $24,999	16.7%	18.4%	18%	14%
$25,000 - $29,999	10.7%	10.2%	12%	10%
$30,000 - $34,999	6%	4.1%	12%	2%
$35,000 - $39,999	3.3%	2%	–	6%
$40,000 - $59,999	0.7%	2%	–	–
$60,000 - $79,999	–	–	–	–
$80,000 - $99,999	–	–	–	–
$100,000 or above	–	–	–	–
Welfare benefits				
Yes	84%	85.7%	84%	82%
No	16%	14.3%	42%	18%
Education				
0-4th grade	4.7%	6.1%	4%	4%
5-8th grade	32%	32.7%	34%	30%
Some high school	28%	20.4%	34%	30%
High school graduate	20.7%	24.5%	18%	18%
Technical/vocational school	2.7%	–	6%	2%
Some college (includes junior)	5.3%	10.2%	2%	4%
4-year college degree	5.3%	4.1%	2%	10%
Post-grad work at university	1.3%	2%	–	2%
Marital Status				
Married	34.7%	42.9%	30%	30%
Not married but cohabitating	40%	32.7%	46%	42%
Single	24%	22.4%	24%	26%
Divorced	0.7%	2%	–	2%
Widowed	0.7%	–	–	–
Age of arrival in the US	18.47 (7.1)	18.93 (7.10)	18.35 (7.19)	18.05 (7.25)
Years living in the US	10.31 (5.87)	10.59 (6.22)	9.79 (5.41)	10.63 (6.14)
Prenatal EPDS score	3.40 (3.39)	2.88 (3.31)	3.74 (3.61)	3.64 (3.26)
Postnatal EPDS score	1.79 (3.63)	2.40 (3.94)	1.87 (4.21)	1.17 (2.58)
BAS score	2.98 (0.45)	2.92 (0.41)	2.94 (0.47)	3.08 (0.45)
BAS Hispanic domain	3.63 (0.49)	3.73 (0.37)	3.65 (0.43)	3.50 (0.62)
BAS non-Hispanic domain	2.34 (0.95)	2.10 (0.91)	2.23 (0.95)	2.67 (0.91)
Acculturative stress score	13.47 (4.04)	14.06 (4.00)	13.94 (3.83)	12.44 (4.20)
Everyday discrimination score	3.05 (5.06)	1.98 (3.03)	3.10 (5.01)	4.10 (6.43)

Note. Numbers in parentheses are standard deviations. Age of arrival and years living in the US are for only non-US born participants. Unless otherwise indicated, all psychosocial scores reflect average values at the prenatal timepoint.

TL, while higher scores on the non-Hispanic domain predicted longer TL. Finally, regarding cultural stress, the acculturative stress score was a negative predictor of TL (b = −0.11, SE = 0.06, β = −0.15, p = .065), while the EDS score did not predict TL (b = 0.06, SE = 0.05, β = .10, p = .208). Of note, although those associations are informative, none reached statistical significance.

3.4. TL and epigenetic immune markers FOXP3

Given the role of leukocyte TL in predicting immune function and the role of inflammation in stress response and depression, we tested whether TL correlated with a marker for Treg cells. TL and *FOXP3* methylation were negatively correlated, r(148) = −0.27, p = .001. That is, higher TL was associated with lower methylation (i.e. increased Treg cells). Given this negative association, the relationship between psychosocial stress and TL was also tested stratified by *FOXP3* methylation status above or below the mean. In these stratified analyses, acculturative stress was not a significant predictor of TL in the low methylation group (b = −0.08, SE = 0.08, β = −0.13, p = .300). However, in the high methylation group, acculturative stress was a negative predictor of TL (b = −0.16, SE = 0.08, β = −0.23, p = .039). That is, among participants with methylation levels indicating lower Treg cell activity, higher levels of acculturative stress predicted shorter TL.

4. Discussion

In this sample of 150 Latinx mothers, we found that TL negatively predicted severity of postnatal depression symptoms such that shorter TL was associated with higher depressive symptom severity scores. Moreover, although no sociodemographic factors were associated with TL, prenatal psychosocial stressors were, and there was evidence of epigenetic-environment interaction in these relationships. Among participants with high *FOXP3* methylation in the Treg-cell-specific-demethylation region (TSDR) – indicating reduced adaptive immuno-regulation capacity – prenatal acculturative stress was negatively associated with TL. That is, higher acculturative stress predicted shorter TL in this subset.

The finding that TL predicted postnatal depressive symptoms is consistent with similar preliminary work in the maternal-child health context (Beijers et al., 2020; Garcia-Martin et al., 2021). However, it is interesting that TL was associated only with severity of depressive symptoms at the postnatal timepoint, but not the prenatal timepoint. This may reflect the unique impact of social stress during pregnancy and in the postnatal period for Latinx mothers. For instance, displacement from family and cultural norms after having a baby may place women at increased vulnerability for TL-related consequences. While exposure to social stress may be significant both pre and postnatally, it may be exacerbated by the additional demands of navigating the healthcare systems and caring for a child. This highlights the importance of considering biological vulnerabilities, such as TL, in conjunction with social pressures, such as family estrangement. Given that a history of depression is often the strongest predictor of postpartum depression, it is notable that TL emerged as a predictor of postnatal EPDS scores even controlling for prenatal scores. This suggests that TL may be a more sensitive indicator of risk than what is, in fact, the most widely used clinical assessment in Latinx maternal health populations.

Despite a wealth of previous research documenting associations between sociodemographic factors and TL across various populations (e.g., Aguayo et al., 2021; Chae et al., 2020; Cherkas et al., 2006; Diez Roux et al., 2009; Entringer et al., 2012, 2011; Flannagan et al., 2017; Geronimus et al., 2015; Hoxha et al., 2009; Ly et al., 2019; Needham et al., 2019, 2017; Niño, 2021; Ruiz et al., 2017; Shiels et al., 2011; Yen and Lung, 2013), we did not find evidence of these relationships in this study. It is possible that this is due to relatively little variability in these characteristics among our participants. For instance, our sample was relatively young, predominantly low-income, and majority non-US born. Therefore, future research should continue probing these associations in participants representing a wider range of sociodemographic characteristics.

Results were also inconsistent with hypotheses about the relationship between discrimination and TL. This was surprising considering substantial previous literature documenting this relationship (Liu and Kawachi, 2017; Needham et al., 2019; Ruiz et al., 2017). However, there is also evidence that discrimination, by itself, may not be a definitive predictor (Coimbra et al., 2020). Instead, discrimination likely interacts with various other factors to produce an impact on TL, factors that

include other social stressors and sociodemographics. We also did not collect information on pre-migration stressful life experiences such as childhood maltreatment, abuse, or poverty. These factors should be considered as potentially meaningful moderators in future research. Additionally, the everyday discrimination scale used here to measure discrimination was developed originally for racial discrimination in Black populations (Bastos et al., 2010). Therefore, it may not be as directly linked to biological impact as measured by TL in this population. For this sample of primarily foreign-born, Latinx mothers, acculturative stress may be a more accurate and salient assessment of chronic social stress exposure and a better predictor of the downstream biological impact of such stress.

Lastly, this study provided novel insight into interactions between an epigenetic marker of immune alterations and a cellular marker of health and aging. Specifically, acculturative stress negatively predicted TL among those high in *FOXP3* TSDR methylation. As these individuals may have impaired adaptive immunoregulation capacity (chronic immune reactivity), this inflammatory profile could predispose them to greater adverse effects from chronic psychosocial stress exposure, including TL degradation. This is consistent with our previous research demonstrating greater stress-related vulnerabilities in participants with high methylation at this particular region that is so critical for Treg development and adaptive immunoregulation (Sluiter et al., 2020). To accurately determine the costs and benefits of such stress-related adaptive immunoregulation in this and similar populations, future investigations should comprehensively evaluate immune- and infection-related clinical outcomes. This is noteworthy as it is postulated that immune and inflammatory related clinical factors may serve as reliable predictors of the risk of adverse postpartum mental health outcomes (Yim et al., 2015).

4.1. Limitations

We note that our sample size was modest in comparison to larger epidemiological studies, but this is balanced by a uniquely rich integration of data sources including psychosocial measures, physiological health markers, and mental health indicators. This allowed us to test novel hypotheses at the intersection of biopsychosocial health and wellbeing. Additionally, the longitudinal nature of this study allowed for strong inferences, specifically regarding the relationship between TL and depressive symptom severity. For instance, we were able to identify TL as a predictor of postnatal depressive symptom severity, even when controlling for prenatal depression symptomology. Finally, we had only one measurement time point for TL during the prenatal period, and future research should evaluate TL changes over time in conjunction with the development of postpartum depressive symptoms.

4.2. Conclusion

In sum, this study adds to the growing literature documenting the potential adverse effects of identity-related stressors, namely acculturative stress, on both physical (at the cellular level) and mental health. Commonly used assessments such as the EPDS may have limited sensitivity to the overall impact of acculturative stress on the risk of postpartum depressive symptomology, and immunity/inflammatory related factors may mediate the effects of this social stress on chromosomal integrity and postpartum mental health. We examined these processes in an underserved group at high risk for health disparities. These findings can therefore bring much-needed increased attention to the adverse effects of social stress in Latinx mothers. This work may also help in targeting interventions for improving Latinx maternal health at multiple junctures, beginning with the acculturative experience, while considering immune and epigenetic profiles that may increase stress sensitivity and downstream risk for mental health concerns including psychiatric disorder development.

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