

**Longitudinal Associations of Family Relationship Quality with Chronic Pain Incidence  
and Persistence Among Aging African Americans**

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## Abstract

**Objectives:** This study examines how family relationships convey risk or resilience for pain outcomes for aging African Americans, and to replicate and extend analyses across two nationally representative studies of aging health.

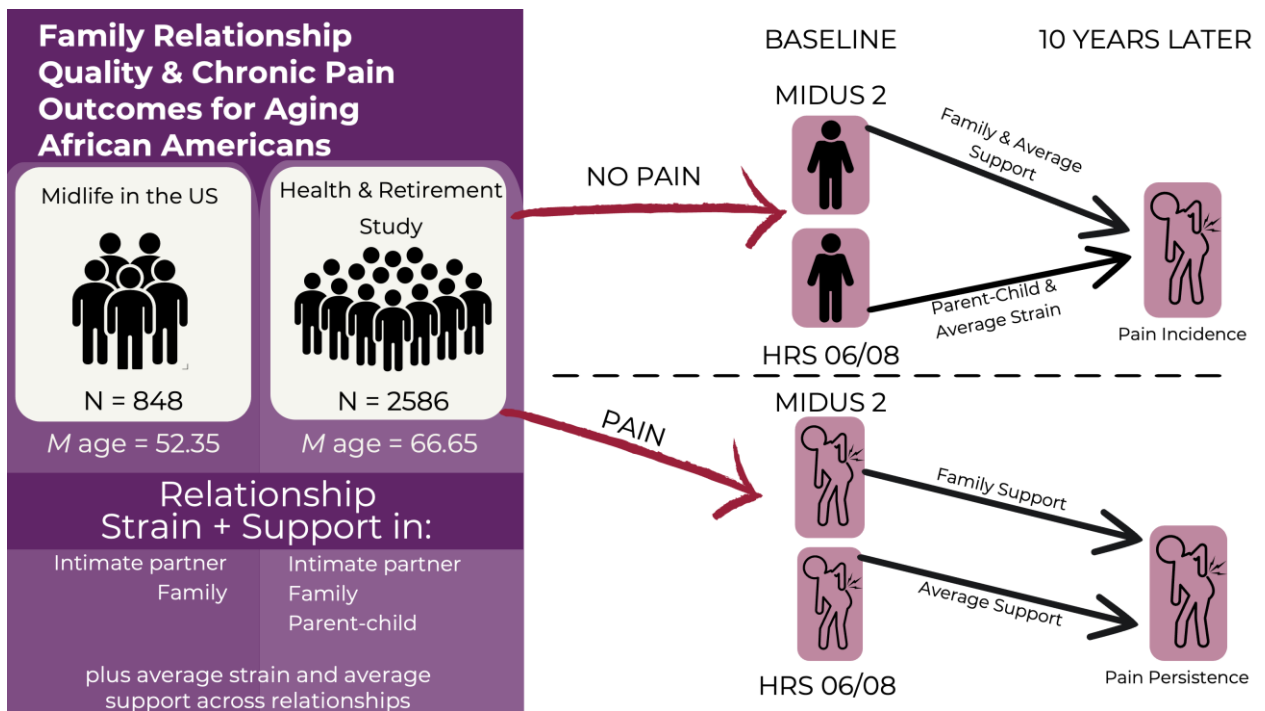
**Method:** African American participants in Midlife in the United States (MIDUS,  $N = 755$ ) and the Health and Retirement Study (HRS,  $N = 2585$ ) self-reported chronic pain status at 2006 waves and then again 10 years later. Logistic regression was used to estimate the odds of pain incidence and persistence explained by family, intimate partner, and parent-child strain and support, as well as average support and average strain across relationships.

**Results:** On average, MIDUS participants were younger ( $M = 52.35$ ,  $SD = 12.06$ ; 62.1% female) than HRS ( $M = 66.65$ ,  $SD = 10.92$ ; 63.7% female). Family support and average support were linked to a decreased odds of pain incidence in MIDUS, but only when tested without accounting for strain, while parent-child strain was a risk factor for pain incidence in HRS, as was average strain. Family support protected against pain persistence in MIDUS, while average support was linked to a reduced odds of pain persisting in HRS.

**Discussion:** Chronic pain outcomes are worse for African Americans for a number of reasons, but parent-child strain may contribute to the risk of new pain developing over time for older adults. Conversely, family support may offer a protective benefit for pain incidence and persistence among aging African Americans. Findings implicate family relationships as a potential target of pain management interventions.

**Keywords:** Chronic pain; Family; Minority and diverse populations; Personal relationships; Longitudinal change

Graphical abstract



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African Americans experience substantial chronic pain disparities; for example, once diagnosed, African Americans experience more severe pain and pain-related disability than other racialized groups (Janevic et al., 2017; Yang et al., 2022). These disparities worsen with age: older African Americans suffer disproportionately worse pain progression, greater pain-related limitations, and increased pain-related mortality, compared to White older adults (Booker et al., 2020; Janevic et al., 2017; Zimmer & Zajacova, 2020). Pain disparities are also potentiated via racial bias in pain management, leading to inadequate pain treatment (Booker et al., 2021). Despite well-documented disparities, aging African Americans are consistently underrepresented in pain research resulting in limited understanding of their macro- and micro- experience of chronic pain (Janevic et al., 2021).

Current knowledge regarding pain predictors and interventions is driven by healthier, Whiter samples than the general population, limiting how we can effectively apply that knowledge, while pain disparities research remains limited by race-based between-groups comparative approaches (Booker et al., 2020; Janevic et al., 2021). Specifying mutable pain precipitants for African Americans – the racialized group at *greatest* risk of pain disparities and injustices – is critical to maximize pain treatment outcomes (Booker et al., 2021). Of known modifiable pain antecedents, chronic stress is a pain contributor made much worse for African Americans by structural inequities that drive pain disparities (Baker et al., 2023; Booker et al., 2021). Stress or strain in family relationships is also exacerbated by these same inequities – yet, is infrequently examined as part of the stress-pain pathway (Woods et al., 2019). Conversely, *family support* lessens stress reactivity, and is a factor identified by African Americans as critical to pain management (Booker et al., 2019; Booker et al., 2020; Mingo et al., 2013; Park et al., 2014; Robinson-Lane, 2020). As a result, we propose that pain research must understand how family stress and support (independently, and in tandem) convey risk or resilience for chronic pain incidence and persistence, exploring within-group

pathways to pain outcomes specifically for aging African Americans. This knowledge has the ability to serve as a foundation for pain interventions tailored for this population, who are more likely to involve family in pain self-management decisions than White peers (Booker, 2016) but may report a tendency to hide pain and remain stoic for family in order to cope and survive (Booker et al., 2020).

### **The Importance of Family Relationships for Pain**

Cross-sectional evidence supports examining family relationships as contributory or protective factors in explaining pain trajectories. Specifically, strained, stressful family relationships have been linked to worse pain severity, pain interference, and greater pain-related disability (Boone & Kim, 2019). On the other hand, family support – which, in the context of chronic pain may include caring, validation, and responsiveness (Richardson et al., 2007) – appears to be linked to pain relief (Che et al., 2018) including decreased pain severity, lower pain-related disability, and improved physical functioning for adults experiencing chronic pain (Reese et al., 2010; Wilson et al., 2017). Specific to pain incidence, prior longitudinal research using a primarily White Midlife in the United States (MIDUS; Ryff, Almeida, Ayanian, Carr, et al., 2017) subsample has identified greater family strain is a risk factor for pain development, while greater family support promotes recovery from acute pain (Woods et al., 2019).

Though research has less often explored family relationship stress and support as factors tied to pain outcomes among aging African Americans, evidence points to the possibility of a distinctly important connection between family relationships and chronic pain. First, a unique strength of the African American community is the extent to which it is family-oriented. Extended family networks and fictive kin are common, key culturally-specific sources of support (Boyd-Franklin, 1989). As a result, African Americans are more

likely to provide support to extended family members than White peers, and more likely to report daily interactions with family (Taylor et al., 2021; Taylor et al., 2013). Further, extended family networks typically assist with caregiving in the context of chronic illness and aging (Dilworth-Anderson et al., 2002), and are more likely to provide disease self-management support than spouses among African Americans, compared to White peers (August & Sorkin, 2011). Thus, for African Americans, a cultural preference for a style of family organization characterized by extended family and kin networks often incorporates collectivistic family relationships, whereby boundaries around *who* is in the family are more permeable, and family support extends to responding to health and illness (McNeil Smith & Landor, 2018). However, it is also important to consider within-group variation in culturally-influenced family experiences (Taylor et al., 2013). Specifically, communal coping with chronic health conditions may vary with age. Evidence suggests older African Americans' contact with family, and provision of family support, may decrease over time (Evans et al., 2019). However, parental status (i.e., older adults with adult children) may protect against aging-related losses in family network size and family support (Taylor et al., 2021). Indeed, older African American adults with no children may be at particular risk of smaller support networks and decreased closeness to family, at a time when family caregiving support may be critical due to an increased risk of declining health (Taylor et al., 2021).

In addition, family relationships appear to be directly connected to pain outcomes for aging African Americans. Prior studies provide evidence that family support is essential for achieving pain management goals among African Americans (Booker et al., 2019). For aging African Americans experiencing pain, family support is often a desired and needed aspect of pain management (Mingo et al., 2013) and family members often provide emotional support, instrumental support, and medical advice (Park et al., 2014). Mingo et al. (2013) found that African Americans preferred pain management programs that involve their family and

include talking with family about their pain. African American participants were also more likely to report they would engage in a pain management program if family recommended it than White participants. These pain management preferences may reflect older African Americans self-reported desire for greater support and caring from family in response to pain (Booker et al., 2019) as well as the support they may need to discuss their pain experiences with family, as hiding pain is a historically-shaped mechanism for survival (Booker et al., 2020).

Despite research suggesting that extended family, and family relationship quality, may have particular importance for understanding the health outcomes of aging African Americans, models of family-pain pathways for this population remain relatively few. In fact, no study has examined longitudinal associations between multiple measures of family strain and support as modulators of pain development and persistence over time for this population. Further, the culturally-specific resource of family-based support has remained relatively untapped in pain management interventions, which are often individually-oriented (Booker, 2016; Booker et al., 2020). As such, it is critical to determine the unique characteristics of family relationships that operate as risk or resilience factors for pain incidence and persistence among older African Americans in order to develop maximally effective family-based pain management interventions to specifically serve this population at greatest risk for pain disparities.

**Theoretical framework.** The theoretical model which has guided this investigation – and which would guide subsequent intervention development – is the Biobehavioral Family Model (Wood et al., 2021). Developed initially to explain psychobiological pathways linking family relationship quality to asthma for pediatric patients, it has been adapted to explain family—health pathways for midlife and older adults (e.g., Woods & Denton, 2014). Specifically, the Biobehavioral Family Model posits that family relationships influence health

outcomes over time via the positivity or negativity of those relationships (i.e., valence) whereby a more negative – or strained – family environment contributes to the confluence of psychophysiological stress reactions contributing to greater disease activity, and worse health outcomes, over time. This theoretical model has been applied to the study of chronic pain previously, with initial support for the model’s pathways in explaining links between family strain and support and pain interference in primarily White samples (Roberson et al., 2022; Signs & Woods, 2020). The Biobehavioral Family Model has also been applied to understanding unique health pathways for African Americans (Priest et al., 2020; Woods et al., 2022). We leverage this theoretical model to inform our research agenda exploring family—pain pathways for aging African Americans, of which the present study is the first component.

### **Present Study**

The purpose of the present study is to estimate how family strain and support are linked to the risk of pain incidence (i.e., developing novel chronic pain) and chronic pain persistence for aging African American adults. We focus on the valence (i.e., positivity or negativity of relationship quality) of aging African Americans’ relationships with their family members, across several different types of relationships (i.e., marital/intimate partner, non-marital family, and parent-child relationships). Guided by the Biobehavioral Family Model, we hypothesize that family strain (i.e., stressful, conflictual, unreliable family relationships) will be associated with an increased risk of pain incidence and persistence, while family support (i.e., warm, responsive, and dependable family relationships) will be linked to a decreased risk of pain incidence and persistence. We tested these hypotheses using multiple methods of estimating family relationship quality in two nationally representative datasets (i.e., MIDUS; Health and Retirement Study) in order to examine whether findings *replicate* across unique samples, as well as to *extend* our ability to estimate family relationship quality



via the unique attributes of each dataset. Finally, as outlined above, between-group pain disparities are well-documented; however, understanding of within-group pain processes for aging African Americans – a racialized group impacted by pain disparities but largely understudied – remains limited (Janevic et al., 2021). Our study aims to move beyond race-based between-group methodologies and identify potentially unique supportive factors within this population that may also be targeted by intervention.

## Method

### Samples

**MIDUS.** MIDUS is a longitudinal, nationally representative study of biopsychosocial pathways to aging. We selected African American participants in the MIDUS 2 (2004-2006; Ryff, Almeida, Ayanian, Carr, et al., 2017) and MIDUS 3 (2013-2014; Ryff, Almeida, Ayanian, Binkley, et al., 2017) core projects, as well as MIDUS 2 and 3 Milwaukee projects (Ryff, Almeida, Ayanian, Binkley, et al., 2018; Ryff, Almeida, Ayanian, Carr, et al., 2018) which were completed contemporaneously with MIDUS 2 and 3 to enhance diversity via newly recruited African American participants selected by probability sampling from the Milwaukee, WI area. We included participants who responded to the study's dichotomous pain status question ("Do you have chronic pain that persists beyond the time of normal healing and has lasted anywhere from a few months to many years?") which equaled 755 participants at baseline (62.4% responded at MIDUS 3).

**HRS.** Second, we analyze data from HRS, a longitudinal panel study of over 26,000 Americans aged 50 and over (Crosswell et al., 2020). HRS's age inclusion criterion presents an opportunity to capture an older sample compared to MIDUS. To achieve replication, we aligned analyses across the two datasets as closely as possible and tested pain outcomes across a 10-year timespan of HRS, using the 2006 wave as baseline (aligning with MIDUS 2;

Health and Retirement Study, [2006 HRS Core] public use dataset, 2011) and 2016 wave to estimate pain outcomes (Health and Retirement Study, [2016 HRS Core] public use dataset, 2019). We specifically selected the subsample of African American participants who responded to the study's dichotomous pain status question ("Are you often troubled with pain?";  $N = 2585$  at baseline, 55.8% responded 10 years later).

## Measures

**Chronic pain.** Primary outcomes included pain incidence (i.e., development of novel chronic pain) and pain persistence, determined using the studies' dichotomous pain status items, described above. Similar to prior research (Nahin et al., 2023), participants who were pain-free at baseline were considered as having developed novel chronic pain if they answered "Yes" to the pain status item at follow-up. Chronic pain present in both survey years was considered persistent pain. Participants who reported cancer-related pain were excluded, given malignant pain's unique mechanisms of action (which are acute and should resolve following successful treatment).

**Relationship strain and support.** A summary of the six relationship strain and support measures we used is found in Table 1. A key reason for separately measuring strain and support is that, in multiple types of relationships, negative and positive relationship quality have been shown to be separate, unique constructs, which can vary separately, rather than representing opposite ends of a single relationship quality dimension (Fincham & Rogge, 2010). Because negativity and positivity vary separately within relationships, estimating the relative contributions of support and strain separately may yield important insights for understanding risk and resilience factors for pain outcomes. Relationship strain and support were thus assessed separately in this study using well-established self-report measures (Walen & Lachman, 2000) that, separately, captured strain and support in intimate

partner and (non-intimate partner/other) family relationships (in both MIDUS and HRS) as well as parent-child relationships (in HRS only, for HRS participants who identified as parents; See Table 1). Each relationship strain measure included four items that assessed how often that family member (i.e., family, intimate partner/spouse, adult child) makes too many demands, criticizes, lets the participant down, and gets on the participant's nerves. Each relationship support measure included three items evaluating how much the participant's family member (i.e., family, intimate partner/spouse, adult child) understands the way they feel, can be relied on to help with a serious problem, and can be opened up to if the participant needs to discuss their worries. Responses on each measure were reverse coded and averaged, such that higher scores reflected a greater level of strain or support.

**Family relationship quality indices.** In addition to using each of the six relationship quality measures as observed variables, we also averaged participants' scores on relationship support measures, and separately, on relationship strain measures, to create two indices for support and strain. This method has been validated in prior research (Farmer et al., 2022). Each index only included relationships participants reported on so that we could capture total experiences of support and strain that accurately reflect the relationship context of each individual. For example, if an HRS participant was married and had no children, we averaged scores on the intimate partner strain and family strain measures to calculate that participant's average strain index. Average scores ranged from 1-4 for support and 1-4 for strain; higher scores indicate greater average support and greater average strain.

**Covariates.** All models account for baseline age, sex (1 = *female*, 0 = *male*), prescription pain medication use (in MIDUS, assessed as past-month use; in HRS, assessed as current regular use for pain in joints or muscles), and incidence of pain-related comorbidities (i.e., diabetes, multiple sclerosis and other neurological disorders, given the possible long-term impacts on neuropathic pain development).

Correlations among independent variables and pain outcomes for MIDUS and HRS samples are presented in Table 2.

## Analyses

We conducted four different sets of analyses to estimate how family strain and support are linked to the likelihood of pain incidence and pain persistence. First, we tested the independent effect of each individual, observed measure of family relationship quality (i.e., family strain, parent-child support, etc.) on later risk of pain incidence, and pain persistence (Table 3). Second, we tested strain and support simultaneously, *within* each category of relationships (e.g., support and strain experienced in intimate partnerships) to estimate the unique variance in pain incidence or persistence risk explained by positive versus negative relationship quality (while accounting for valence measured in the opposite direction) within each type of relationships (Table 4). Third, we modeled the impact of average relationship strain, and separately modeled the impact of average relationship support, on pain incidence, and pain persistence (Table 5). Finally, we modeled average strain and average support *simultaneously* in order to estimate the association of average relationship strain with pain incidence or persistence, while accounting for average relationship support (Table 5). Relationship quality indices were computed in SPSS (IBM Corp, 2021) to utilize all available information, prior to model-testing.

This approach totals four types of pain incidence models, and four types of pain persistence models; each model was tested first with MIDUS data and then, separately, we replicated and extended our analyses by testing each model with HRS data. Given the dichotomous nature of our pain outcomes, all models were tested using logistic regression via MPlus (Version 8.10, Muthén & Muthén, 2017) in which Monte Carlo integration was used to estimate all models.

**Missingness.** Attrition at MIDUS 3 was significantly more likely for participants who were older ( $t(753) = 5.523, p < .001$ ) and who reported taking prescription pain medication at baseline ( $X^2(1) = 6.901, p = .009$ ) than participants retained at both waves. Similarly, attrition in HRS was more likely for older participants ( $t(2584) = 21.071, p < .001$ ) and those reporting prescription pain medication use at baseline ( $X^2(1) = 10.177, p < .001$ ), but also for men ( $X^2(1) = 12.213, p < .001$ ) and individuals reporting baseline comorbidities ( $X^2(1) = 46.168, p < .001$ ). Thus, we determined data were missing at random in both MIDUS and HRS. However, in order to remain consistent in our analyses across datasets, we included age, sex, prescription pain medication use, and comorbidities (as described above) to reduce bias in parameter estimates caused by missingness using full information maximum likelihood (FIML). The FIML approach is the best method for maintaining the integrity of all of the available data while accounting for characteristics related to missingness/attrition, and is preferred over listwise deletion (Allison, 2002) or pain prevalence studies' use of data replacement for missing values (e.g., Zimmer & Zajacova, 2020).

## Results

### Demographics

On average, MIDUS participants were younger ( $M$  age = 52.35,  $SD$  = 12.06) than HRS participants ( $M$  age = 66.65,  $SD$  = 10.92). In both MIDUS and HRS, most participants were female (62.1% and 63.7%, respectively) while a minority were married (38.1% and 39.6%, respectively). The proportion of each sample who reported they were currently married reflects U.S. Census Bureau data documenting 38% of older African Americans report they are currently married (Administration for Community Living, 2021). In each sample, most reported no chronic pain at baseline ( $n = 525$  in MIDUS or 69.5%;  $n = 1741$  in HRS or 67.4%) and were included in pain incidence analyses, while a minority in each ( $n =$

230 in MIDUS or 30.5%;  $n = 844$  in HRS or 32.6%) reported chronic pain at baseline and were included in pain persistence analyses.

### **Independent Effects**

**MIDUS.** Baseline family support was linked to a 33% decreased odds of pain incidence ( $OR = .67, p = .026$ ; Table 3) among MIDUS participants. Results similarly indicated that family support was significantly tied to a 47% decreased odds of pain persistence ( $OR = 0.53, p = .023$ ). Pain incidence and persistence models testing family strain, intimate partner support, and intimate partner strain were nonsignificant.

**HRS.** We next replicated tests of these models using HRS data. Results indicated parent-child strain was significantly linked to a 43% greater probability of pain developing 10 years later, among HRS participants reporting no chronic pain at baseline ( $OR = 1.43, p = .018$ ). Though none of our pain persistence models were significant, results tentatively suggest family support may be tied to a decreased risk of chronic pain persisting over time ( $CI [.55, 1.001]$ ).

### **Relationship Quality Within Categories of Relationship Types**

**MIDUS.** Testing family strain and support simultaneously resulted in nonsignificant links to pain incidence, as did testing intimate partner strain and support in the same model (Table 4). However, similar to results above, family support was linked to a 48% decreased odds of pain persistence ( $OR = 0.52, p = .020$ ) when accounting for family strain (which was not linked to pain persistence). Intimate partner relationship quality was not linked to pain persistence among MIDUS participants.

**HRS.** When tested alongside parent-child support (which was not significantly linked to pain incidence), worse parent-child strain remained significantly linked to a 44.5% greater

likelihood of pain incidence (OR = 1.44,  $p = .010$ ). Neither the family nor intimate partner relationship quality models identified significant links to pain incidence over time. Similarly, none of the models estimating strain and support within specific types of relationships located significant links to pain persistence among HRS participants.

### **Average Strain or Support Across Relationship Types**

**MIDUS.** Among MIDUS participants, average support experienced across family and intimate partner relationships was significantly linked to a reduced probability of pain incidence 10 years later, at a magnitude similar to the family support findings described above in our independent effects model (OR = 0.67,  $p = .037$ ; Table 5). Conversely, despite significant family support links to pain persistence in our independent effects and relationship type models, above, average support experienced across relationships was *not* significantly linked to pain persistence (OR = 0.65,  $p = .125$ ). Average relationship strain was not significantly linked to either pain incidence or pain persistence in MIDUS.

**HRS.** Average relationship support (i.e., across the three relationship types) was not linked to later pain incidence in HRS. However, average relationship strain was significantly linked to pain incidence, at a magnitude similar to parent-child strain–pain incidence links found in models described above. Specifically, the averaged relationship strain variable was linked to a 47% increased odds of developing chronic pain 10 years later for HRS participants reporting no chronic pain at baseline (OR = 1.47,  $p = .005$ ).

Conversely, among HRS participants reporting chronic pain at baseline, average relationship support, but not average relationship strain, was significantly linked to the odds of pain persisting. Participants reporting a higher average of relationship support experienced across all relationships at baseline were 33% more likely to report their chronic pain had dissipated 10 years later (OR = .67,  $p = .035$ ).

## Models Simultaneously Testing Average Strain and Average Support

**MIDUS.** Average support (across family and intimate partner relationships) was no longer a significant predictor of pain incidence when tested in the same model as average relationship strain, similar to the results of our model testing family support and family strain simultaneously. Indeed, the magnitude of ties between family support and average support to pain incidence is similar in our independent effects and average support models (Tables 3, 5), while the magnitude is decreased and thus nonsignificant when accounting for family strain, and average strain, respectively (Tables 4, 5). Neither average support nor average strain were significantly tied to pain persistence among MIDUS participants.

**HRS.** Average relationship strain across all relationships remained significantly tied to the likelihood of novel chronic pain developing 10 years later when tested alongside average support. Specifically, for every one-unit increase in average strain reported by HRS participants at baseline, the likelihood of pain incidence increased by 49% (OR = 1.49,  $p = .009$ ), while accounting for average support experienced in these same relationships (which was not significantly tied to pain incidence).

Similarly, as with our average support model results described above, average support experienced across relationships was significantly linked to a 34% decreased likelihood of pain persistence for HRS participants reporting chronic pain at baseline (OR = 0.66,  $p = .035$ ), while simultaneously accounting for average relationship strain (which was not significantly linked to pain persistence).



## Discussion

The novel results of this study support the inclusion of relationship strain and support in a comprehensive understanding of pain outcomes for older African Americans. First, our findings suggest family support – family relationship quality characterized by warmth, reliability, and dependability – may be a key protective factor for the occurrence of new chronic pain, as well as the persistence of that pain over time, for aging African Americans. These findings are consistent with, and extend, previous studies testing the Biobehavioral Family Model (e.g., Woods & Denton, 2014; Signs & Woods, 2020). Specifically, greater family support, as well as greater support experienced across relationships, on average, were each linked to a decreased risk of pain incidence 10 years later for MIDUS participants. Indeed, the protective effects of supportive family relationships found in this study exceed previously established pain-protective benefits of vigorous physical activity and engagement in cultural activities for older adults (Fancourt & Steptoe, 2018).

Furthermore, aging African Americans who were experiencing chronic pain at baseline but who reported greater family support (MIDUS) or greater support, on average, across their family relationships (HRS) were significantly more likely to report *pain relief* over the next decade. The link between average relationship support and pain persistence in HRS was also found when tested concurrently with average relationship strain – consistent with our observation, throughout, of the prominence of positive relationship quality (support) as a predictor of pain outcomes in contrast to negative relationship quality (strain). In total, African Americans who are surrounded by positive relationships with family may be less likely to experience chronic pain as they age, but once pain develops, may be especially likely to achieve chronic pain remission – a particularly important result of this study.

When we extended our analyses to include parent-child support and strain in HRS, we found that aging African Americans who reported greater strain in their relationships with their children – feeling more like their child was demanding, critical, or was someone who let them down or got on their nerves – had a significantly greater likelihood of developing chronic pain over the following 10 years. Greater average strain, across all relationships, was also linked to a significantly greater risk of pain incidence. Indeed, the effects of parent-child strain and average relationship strain were consistent: across models, each was linked to a 43-49% greater odds of new pain developing. This effect size is similar to the risk of acute pain transitioning to chronic low back pain that is attributed to somatization (Pincus et al., 2002), and exceeds the established link between smoking and increased low back pain incidence (Shiri et al., 2010). While prior research has raised concerns about childless aging African Americans who may be at risk for both declining health and a lack of caregiving support (Taylor et al., 2021), our results suggest that aging African Americans who are parents but describe their relationships with their children as particularly stressful may also be at greater risk of worse health outcomes in the form of developing chronic pain.

The link between parent-child strain and pain incidence for HRS participants may reflect the older age of this sample, on average. Aging poses health challenges, including a greater risk of chronic pain (Zimmer & Zajacova, 2020), which occur concomitantly with the normative process of trimming social relationships or losing them to distance and death (Liu & Waite, 2014; Taylor et al., 2021; Thomas et al., 2017). Family relationships become even more important as individuals age, at the same time as caregiving needs increase and other non-family relationships become fewer and further between (Milkie et al., 2008; Thomas et al., 2017). Strained relationships between parents and their adult children may thus pose a greater risk for worse pain outcomes for older adults who are already at greatest risk of chronic pain, and in the greatest need of caregiving support from their closest ties. Prior

research has found that older African Americans with chronic osteoarthritis pain expect family to provide needed support; when support expectations are not met, the quality of those relationships decline (Booker et al., 2019). It is, however, unknown whether patterns of parent-child relationship strain may *precede* the development of chronic pain but then be exacerbated by pain-related caregiving needs, forming a reciprocal, escalating association (i.e., positive feedback loop; (Leonard et al., 2006) over time. Prospective research that replicates the observed links in HRS between parent-child strain and pain incidence is needed, and should test whether older age potentiates this relationship.

In total, though our findings reflect prior research linking supportive family relationships to a reduced risk of pain persistence (Woods et al., 2019), and strained family relationships to worse pain outcomes (Boone & Kim, 2019) including a greater likelihood of pain incidence (Woods et al., 2019), the literature heretofore has largely remained cross-sectional and race-comparative (Booker et al., 2021; Janevic et al., 2021). This study advances the literature by using within-group analyses to examine family-pain pathways over time specifically for older African Americans.

Our results implicate the value of assessing the *totality* of an individual's experiences across their family relationships in order to best understand possible pain outcomes. Future research could build upon these findings to test how changes in family relationship quality unfold over time in tandem with intra-individual variations in pain outcomes in order to identify ideal times to tap into the healing benefits of family support, specifically for African Americans. In other words, continuing to examine both strain and support occurring in these key relationships, the intensity of these relationship quality dimensions, as well as their balance and interaction, will provide additional evidence of how the complex interplay of relationship quality occurring across family relationships may potentiate, or protect against, chronic pain disparities experienced by older African Americans. Further, *how* family

relationship quality is linked to underlying pain pathophysiology is less clear. Theoretically-driven mediation models to test mechanisms of effect through which family relationships influence pain outcomes for aging African Americans are needed. In particular, continuing to leverage the Biobehavioral Family Model for explicating these mechanisms may be advantageous, as the model posits psychophysiological (i.e., biobehavioral) stress pathways linking a more negative family emotional climate to worse disease activity over time. For example, the theoretical framework would indicate testing depression and anxiety as psychological distress mediators linking family relationship quality and pain – an approach supported by literature indicating each as robust risk factors for pain incidence and outcomes (Meints & Edwards, 2018). Moreover, tests of contextual moderators of the present pathways – including, for example, racism and discrimination or socioeconomic disparities – is also supported by the model, and reflect important future next steps in elucidating possible pain-promoting variations in family relationship quality due to the stress of structural disadvantage (Wood et al., 2021).

### **Clinical Implications**

We argue the present findings build on prior research to emphasize it may be most advantageous to leverage and enhance family support in order to improve pain management outcomes for aging African Americans. Indeed, our results are consistent with what older African American patients living with chronic pain say they need, which is family support in order to effectively manage their pain (Booker et al., 2019; Mingo et al., 2013). As a result, healthcare providers should concentrate on positive connection and support in African Americans' family relationships: (1) by determining pain treatment approaches for chronic pain collaboratively with the patient and family (e.g., Booker, 2016), (2) by engaging particularly caring, warm, and reliable family relationships in pain management efforts, and (3) by enhancing positive relationship quality in patient-family relationships in order to

protect against, or mitigate, pain. Incorporating regular assessments of family relationship quality as standard of care is key to understand the support network of African American patients and be able to effectively engage who a patient considers family. Engaging family in primary care (for preventative benefits) or pain treatment (for pain relief) may even serve to enhance the warmth and connection of existing positive relationships, as well as improve the patient's felt trust and safety of engaging with the healthcare system (Booker, 2016). Additional intervention to promote support, and mitigate relationship strain, in medical settings may be aided by use of an integrated behavioral health model, especially via incorporating culturally-responsive family therapists – mental health experts with specific expertise in family relationships (McDaniel et al., 2013). Use of a culturally-sensitive pain management model of care – particularly for older African Americans – may help to ensure congruent, acceptable practices of engaging family as well as the provision of evidence-based pain care for a patient population at greatest risk of pain treatment disparities (Booker & Herr, 2015).

Engaging family in healthcare (McDaniel et al., 2013) and particularly pain management (e.g., Booker, 2016; Robinson-Lane & Booker, 2017) is not a new idea. However, given the present findings (including surprisingly nonsignificant links between intimate partner relationship quality and pain outcomes) as well as culturally-specific definitions of family which are potentially unique for African Americans (Taylor et al., 2013), a family-based pain management approach requires extending intervention reach beyond an individual's marriage. Yet spousal/intimate partner relationships remain the most common relationship emphasized in pain research and pain management intervention (e.g., Romano et al., 2011; Soto et al., 2022). Indeed, though there is growing evidence for couple-based pain management interventions (Tankha et al., 2020), to date there are no evidence-based family interventions for pain. Further, existing relational interventions for pain

management have been developed and tested with predominantly White samples. The development of culturally-adapted, family-based pain management interventions for aging African Americans is a critical next step.

### **Limitations & Strengths**

Our theoretically-driven tests of family-pain pathways for aging African Americans illuminate important and culturally-relevant discoveries. This study is one of the first focusing on an important piece of African American culture in understanding chronic pain – family relationships. To do so, we leveraged two large, nationally representative secondary datasets to replicate and extend our innovative tests of family support and strain associations with longitudinal pain outcomes. An additional strength is our incorporation of positive *and* negative relationship quality (support versus strain) experienced across several types of family relationships, which is particularly novel but also valuable for identifying areas amenable to intervention.

However, this study is not without limitations. Though we replicated models using data from two cutting-edge studies of aging health, the size of the MIDUS pain persistence subsample (i.e.,  $n = 230$  reporting chronic pain at baseline) may have limited our ability to detect small effects. In addition, though both MIDUS and HRS specify definitions of “other” (non-marital) family relationships, even those remain broad (e.g., siblings, parents, grandparents) and did not solicit participants’ responses regarding *who* they were considering when completing these specific family items. Prior research suggests that variations in which relationships participants report on, in response to family relationship quality measures, may result in measurement heterogeneity (Priest et al., 2018). Future research may benefit from capturing a more nuanced self-report of both family structure and which types of family relationships participants consider as part of their support network.

## Conclusion

We found that family support and parent-child strain were significantly linked to chronic pain incidence and persistence for older African American adults. Thus, our results highlight the significance of family relationships for aging African Americans' pain outcomes, and advance pain research often limited by primarily White samples or a between-groups approach. These associations of risk and resilience for chronic pain illuminate potentially potent areas of intervention (e.g., parent-child strain) that align with African Americans' self-expressed need for family support for pain management. Guided by the Biobehavioral Family Model and coupled with prior research identifying the need for intergenerational family-based interventions to improve persistent pain for this population (Booker et al., 2019), the present findings support the development of theoretically-driven family-based pain management interventions that are culturally-responsive and specifically designed to meet the needs of this patient population.

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## **Conflict of Interest**

None.

## **Data Availability**

Data used for this study are publicly available and distributed via the University of Michigan, including the Inter-University Consortium for Political and Social Research. Meta-data for this study are available via the NIH HEAL Data Platform. There is no additional public preregistration affiliated with this study.

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## References

- Administration for Community Living. (2021). 2020 Profile of Older Americans. U.S. Department of Health and Human Services.  
<https://acl.gov/sites/default/files/Profile%20of%20OA/AAPProfileReport2021.pdf>
- August, K. J., & Sorkin, D. H. (2011). Racial/ethnic disparities in exercise and dietary behaviors of middle-aged and older adults. *Journal of General Internal Medicine*, 26, 245-250.  
<https://doi.org/10.1007/s11606-010-1514-7>
- Baker, T. A., Booker, S. Q., & Janevic, M. R. (2023). A progressive agenda toward equity in pain care. *Health Psychology and Behavioral Medicine*, 11(1), 2266221.  
<https://doi.org/10.1080/21642850.2023.2266221>
- Booker, S. Q. (2016). #Blacklivesmatter: Leveraging family collaboration in pain management. *Nursing2020 Critical Care*, 11(2), 1-7.  
<https://doi.org/10.1097/01.CCN.0000480749.23473.b6>
- Booker, S. Q., Bartley, E. J., Powell-Roach, K., Palit, S., Morais, C., Thompson, O. J., Cruz-Almeida, Y., & Fillingim, R. B. (2021). The Imperative for Racial Equality in Pain Science: A Way Forward. *The Journal of Pain*, 22(12), 1578-1585.  
<https://doi.org/https://doi.org/10.1016/j.jpain.2021.06.008>
- Booker, S. Q., Cousin, L., & Buck, H. G. (2019). “Puttin’ on”: Expectations versus family responses, the lived experience of older African Americans with chronic pain. *Journal of Family Nursing*, 25(4), 533-556. <https://doi.org/10.1177/1074840719884560>
- Booker, S. Q., Tripp-Reimer, T., & Herr, K. A. (2020). “Bearing the Pain”: The experience of aging African Americans with osteoarthritis pain. *Global Qualitative Nursing Research*.  
<https://doi.org/10.1177/2333393620925793>

- Booker, S. S., & Herr, K. A. (2015). Pain Management for Older African Americans in the Perianesthesia Setting: The “Eight I’s”. *Journal of Perianesthesia Nursing*, 30(3), 181-188. <https://doi.org/10.1016/j.jopan.2015.01.011>
- Boone, D., & Kim, S. Y. (2019). Family Strain, Depression, and Somatic Amplification in Adults with Chronic Pain. *International Journal of Behavioral Medicine*, 26(4), 427-436. <https://doi.org/10.1007/s12529-019-09799-y>
- Boyd-Franklin, N. (1989). *Black families in therapy: A multisystems approach*. Guilford Press.
- Che, X., Cash, R., Ng, S. K., Fitzgerald, P., & Fitzgibbon, B. M. (2018). A systematic review of the processes underlying the main and the buffering effect of social support on the experience of pain. *The Clinical Journal of Pain*, 34(11), 1061-1076. <https://doi.org/10.1097/AJP.0000000000000624>
- Crosswell, A. D., Suresh, M., Puterman, E., Gruenewald, T. L., Lee, J., & Epel, E. S. (2020). Advancing research on psychosocial stress and aging with the Health and Retirement Study: Looking back to launch the field forward. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 75(5), 970-980. <https://doi.org/10.1093/geronb/gby106>
- Dilworth-Anderson, P., Williams, I. C., & Gibson, B. E. (2002). Issues of race, ethnicity, and culture in caregiving research: A 20-year review (1980–2000). *The Gerontologist*, 42(2), 237-272. <https://doi.org/10.1093/geront/42.2.237>
- Evans, M. C., Bazargan, M., Cobb, S., & Assari, S. (2019). Pain Intensity among Community-Dwelling African American older adults in an economically disadvantaged area of Los Angeles: Social, Behavioral, and Health Determinants. *International Journal of*

- Environmental Research and Public Health*, 16(20).  
<https://doi.org/10.3390/ijerph16203894>
- Fancourt, D., & Steptoe, A. (2018). Physical and psychosocial factors in the prevention of chronic pain in older age. *The Journal of Pain*, 19(12), 1385-1391.  
<https://doi.org/https://doi.org/10.1016/j.jpain.2018.06.001>
- Farmer, H. R., Thomas Tobin, C. S., & Thorpe, R. J., Jr. (2022). Correlates of Elevated C-Reactive Protein Among Black Older Adults: Evidence From the Health and Retirement Study. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 77(11), 1964-1977. <https://doi.org/10.1093/geronb/gbac033>
- Fincham, F. D., & Rogge, R. D. (2010). Understanding relationship quality: Theoretical challenges and new tools for assessment. *Journal of Family Theory and Review*, 2, 227-242. <https://doi.org/10.1111/j.1756-2589.2010.00059.x>
- Health and Retirement Study, (2006 HRS Core) public use dataset. (2021). Produced and distributed by the University of Michigan with funding from the National Institute on Aging (NIA U01 AG009740). Ann Arbor, MI. <https://hrsdata.isr.umich.edu/data-products/2006-hrs-core>
- Health and Retirement Study, (2016 HRS Core) public use dataset. (2019). Produced and distributed by the University of Michigan with funding from the National Institute on Aging (NIA U01 AG009740). Ann Arbor, MI. <https://hrsdata.isr.umich.edu/data-products/2016-hrs-core>
- IBM Corp. (2021). *IBM SPSS Statistics for Windows, Version 28.0*. Armonk, NY: IBM Corp.

- Janevic, M. R., Mathur, V. A., Booker, S. Q., Morais, C., Meints, S. M., Yeager, K. A., & Meghani, S. H. (2021). Making Pain Research More Inclusive: Why and How. *The Journal of Pain*. <https://doi.org/10.1016/j.jpain.2021.10.004>
- Janevic, M. R., McLaughlin, S. J., Heapy, A. A., Thacker, C., & Piette, J. D. (2017). Racial and Socioeconomic Disparities in Disabling Chronic Pain: Findings From the Health and Retirement Study. *The Journal of Pain*, *18*(12), 1459-1467. <https://doi.org/https://doi.org/10.1016/j.jpain.2017.07.005>
- Leonard, M. T., Cano, A., & Johansen, A. B. (2006). Chronic Pain in a Couples Context: A Review and Integration of Theoretical Models and Empirical Evidence. *The Journal of Pain*, *7*(6), 377-390. <https://doi.org/10.1016/j.jpain.2006.01.442>
- Liu, H., & Waite, L. (2014). Bad Marriage, Broken Heart? Age and Gender Differences in the Link between Marital Quality and Cardiovascular Risks among Older Adults. *Journal of Health and Social Behavior*, *55*(4), 403-423. <https://doi.org/10.1177/0022146514556893>
- McDaniel, S. H., Doherty, W. J., & Hepworth, J. (2013). *Medical family therapy and integrated care* (2 ed.). American Psychological Association.
- McNeil Smith, S., & Landor, A. M. (2018). Toward a better understanding of African American families: Development of the sociocultural family stress model. *Journal of Family Theory & Review*, *10*(2), 434-450. <https://doi.org/10.1111/jftr.12260>
- Meints, S. M., & Edwards, R. R. (2018). Evaluating psychosocial contributions to chronic pain outcomes. *Progress in Neuropsychopharmacology & Biological Psychiatry*, *87*, 168-182. <http://doi.org/10.1016/j.pnpbp.2018.01.017>

- Milkie, M. A., Bierman, A., & Schieman, S. (2008). How Adult Children Influence Older Parents' Mental Health: Integrating Stress-process and Life-course Perspectives. *Social Psychology Quarterly*, 71(1), 86-105. <https://doi.org/10.1177/019027250807100109>
- Mingo, C. A., McIlvane, J. M., Jefferson, M., Edwards, L. J., & Haley, W. E. (2013). Preferences for arthritis interventions: Identifying similarities and differences among African Americans and Whites with osteoarthritis. *Arthritis Care & Research*, 65(2), 203-211. <https://doi.org/10.1002/acr.21781>
- Muthén, L., & Muthén, B. (2017). Mplus. Muthén & Muthén.
- Nahin, R. L., Feinberg, T., Kapos, F. P., & Terman, G. W. (2023). Estimated Rates of Incident and Persistent Chronic Pain Among US Adults, 2019-2020. *JAMA Network Open*, 6(5), e2313563-e2313563. <https://doi.org/10.1001/jamanetworkopen.2023.13563>
- Park, J., Lavin, R., & Stahnke, B. (2014). Choice of nonpharmacological pain therapies by ethnically diverse older adults. *Pain Management*, 4(6), 389-406. <https://doi.org/10.2217/pmt.14.43>
- Pincus, T., Burton, A. K., Vogel, S., & Field, A. P. (2002). A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. *Spine*, 27(5), E109-E120. <https://doi.org/10.1097/00007632-200203010-00017>
- Priest, J. B., McNeil Smith, S., Woods, S. B., & Roberson, P. N. E. (2020). Discrimination, family emotional climate, and African American health: An application of the BBFM. *Journal of Family Psychology*, 34(5), 598-609. <http://doi.org/10.1037/fam0000621>
- Priest, J. B., Parker, E. O., & Woods, S. B. (2018). Do the constructs of the FACES IV change based on definitions of “family?” A measurement invariance test. *Journal of Marital and Family Therapy*, 44(2), 336-352. <https://doi.org/10.1111/jmft.12257>

- Reese, J. B., Somers, T. J., Keefe, F. J., Mosley-Williams, A., & Lumley, M. A. (2010). Pain and functioning of rheumatoid arthritis patients based on marital status: is a distressed marriage preferable to no marriage? *Journal of Pain, 11*(10), 958-964.  
<https://doi.org/10.1016/j.jpain.2010.01.003>
- Richardson, J. C., Ong, B. N., & Sim, J. (2007). Experiencing chronic widespread pain in a family context: giving and receiving practical and emotional support. *Sociology of Health & Illness, 29*(3), 347-365. [https://doi.org/https://doi.org/10.1111/j.1467-9566.2007.00496.x](https://doi.org/10.1111/j.1467-9566.2007.00496.x)
- Roberson, P. N. E., Cortez, G., Freeman, T., Lloyd, J., Tasman, J., & Woods, S. B. (2022). Relationship quality and psychophysiological distress for underserved breast cancer patients and their caregiver before treatment. *Psycho-Oncology, 31*(11), 1904-1912.  
<https://doi.org/10.1002/pon.6035>
- Robinson-Lane, S. G. (2020). Adapting to chronic pain: A focused ethnography of black older adults. *Geriatric Nursing, 41*(4), 468-473.  
<https://doi.org/10.1016/j.gerinurse.2019.08.001>
- Robinson-Lane, S. G., & Booker, S. Q. (2017). Culturally responsive pain management for Black older adults. *Journal of Gerontological Nursing, 43*(8), 33-41.  
<https://doi.org/10.3928/00989134-20170224-03>
- Romano, J. M., Cano, A., & Schmaling, K. B. (2011). Assessment of couples and families with chronic pain. In *Handbook of Pain Assessment* (3rd ed., pp. 98-114). The Guilford Press.
- Ryff, C., Almeida, D., Ayanian, J., Binkley, N., Carr, D. S., Coe, C., Davidson, R., Grzywacz, J., Karlamangla, A., Krueger, R., Lachman, M., Love, G., Mailick, M., Mroczek, D., Radler, B., Seeman, T., Sloan, R., Thomas, D., Weinstein, M., & Williams, D. (2017). *Midlife in*

*the United States (MIDUS 3), 2013-2014*. Distributed by the Inter-University Consortium for Political and Social Research at University of Michigan with funding from the National Institute on Aging (P01 AG020166; U19 AG051426). Ann Arbor, MI.  
<https://doi.org/10.3886/ICPSR36346.v6>

Ryff, C., Almeida, D. M., Ayanian, J., Carr, D. S., Cleary, P. D., Coe, C., Davidson, R., Krueger, R. F., Lachman, M. E., Marks, N. F., Mroczek, D. K., Seeman, T., Seltzer, M. M., Singer, B. H., Sloan, R. P., Tun, P. A., Weinstein, M., & Williams, D. (2017). *Midlife in the United States (MIDUS 2), 2004-2006*. Distributed by the Inter-University Consortium for Political and Social Research at University of Michigan with funding from the National Institute on Aging (P01 AG020166; U19 AG051426). Ann Arbor, MI.  
<https://doi.org/10.3886/ICPSR04652.v7>

Ryff, C. D., Almeida, D., Ayanian, J., Binkley, N., Carr, D. S., Coe, C., Davidson, R., Grzywacz, J. G., Karlamangla, A., Krueger, R., Lachman, M. E., Love, G., Seltzer, M., Mroczek, D. K., Radler, B., Seeman, T. E., Sloan, R., Thomas, D., Weinstein, M., & Williams, D. (2018). *Midlife in the United States (MIDUS 3): Milwaukee African American Sample, 2016-2017*. Distributed by the Inter-University Consortium for Political and Social Research at University of Michigan with funding from the National Institute on Aging (P01 AG020166; U19 AG051426). Ann Arbor, MI.  
<https://doi.org/10.3886/ICPSR37120.v2>

Ryff, C. D., Almeida, D., Ayanian, J., Carr, D., Cleary, P. D., Coe, C., Davidson, R., Krueger, R., Lachman, M., Marks, N., Mroczek, D., Seeman, T., Seltzer, M., Singer, B., Sloan, R., Tun, P., Weinstein, M., & Williams, D. (2018). *Midlife in the United States (MIDUS 2): Milwaukee African American Sample, 2005-2006*. Distributed by the Inter-University



- Consortium for Political and Social Research at University of Michigan with funding from the National Institute on Aging (P01 AG020166; U19 AG051426). Ann Arbor, MI. <https://doi.org/10.3886/ICPSR22840.v5>
- Shiri, R., Karppinen, J., Leino-Arjas, P., Solovieva, S., & Viikari-Juntura, E. (2010). The Association between Smoking and Low Back Pain: A Meta-analysis. *The American Journal of Medicine*, 123(1), 87.e87-87.e35. <https://doi.org/https://doi.org/10.1016/j.amjmed.2009.05.028>
- Soto, S. H., Hales, D. P., Callahan, L. F., & Rini, C. (2022). Partner and relationship predictors of longitudinal physical activity trajectories among individuals with osteoarthritis using latent class growth analysis. *Annals of Behavioral Medicine*, 56(7), 685-697. <https://doi.org/10.1093/abm/kaab054>
- Tankha, H., Caño, A., & Dillaway, H. (2020). "Now I have hope": Rebuilding relationships affected by chronic pain. *Families, Systems & Health*, 38(1), 51-56. <https://doi.org/10.1037/fsh0000472>
- Taylor, R. J., Chatters, L. M., & Cross, C. J. (2021). Taking diversity seriously: Within- group heterogeneity in African American extended family support networks. *Journal of Marriage and Family*, 83(5), 1349-1372. <https://doi.org/10.1111/jomf.12783>
- Taylor, R. J., Chatters, L. M., Woodward, A. T., & Brown, E. (2013). Racial and Ethnic Differences in Extended Family, Friendship, Fictive Kin, and Congregational Informal Support Networks. *Family Relations*, 62(4), 609-624. <https://doi.org/https://doi.org/10.1111/fare.12030>
- Thomas, P. A., Liu, H., & Umberson, D. (2017). Family relationships and well-being. *Innovation in Aging*, 1(3). <https://doi.org/10.1093/geroni/igx025>



- Walen, H. R., & Lachman, M. E. (2000). Social support and strain from partner, family, and friends: Costs and benefits for men and women in adulthood. *Journal of Social and Personal Relationships*, *17*(1), 5-30. <https://doi.org/10.1177/0265407500171001>
- Wilson, S. J., Martire, L. M., & Sliwinski, M. J. (2017). Daily spousal responsiveness predicts longer-term trajectories of patients' physical function. *Psychological Science*, *28*(6), 786-797. <https://doi.org/10.1177/0956797617697444>
- Wood, B. L., Woods, S. B., Sengupta, S., & Nair, T. (2021). The Biobehavioral Family Model: An evidence-based approach to biopsychosocial research, residency training, and patient care. *Frontiers in Psychiatry*, *12*, 725045. <https://doi.org/10.3389/fpsy.2021.725045>
- Woods, S. B., & Denton, W. H. (2014). The Biobehavioral Family Model as a framework for examining the connections between family relationships, mental, and physical health for adult primary care patients. *Families Systems, & Health*, *32*(2), 235-240. <https://doi.org/10.1037/fsh0000034>
- Woods, S. B., Hiefner, A., Roberson, P. N. E., Zahra, N., Arnold, E. M., & Udezi, V. (2022). Depressed mood and environmental mastery as potential pathways linking family relationship quality and disease self-management for African Americans with hypertension. *Family Process*, *62*(1), 230-253. <https://doi.org/10.1111/famp.12789>
- Woods, S. B., Priest, J. B., Kuhn, V., & Signs, T. (2019). Close relationships as a contributor to chronic pain pathogenesis: Predicting pain etiology and persistence. *Social Science & Medicine*, *237*, 112452. <https://doi.org/10.1016/j.socscimed.2019.112452>
- Yang, Y., Reid, M. C., Grol-Prokopczyk, H., & Pillemer, K. (2022). Racial-ethnic Disparities in Pain Intensity and Interference Among Middle-aged and Older U.S. Adults. *Journals of*

*Gerontology, Series A: Biological Sciences and Medical Sciences*, 77(2), e74-e81.

<https://doi.org/10.1093/gerona/glab207>

Zimmer, Z., & Zajacova, A. (2020). Persistent, consistent, and extensive: The trend of increasing pain prevalence in older Americans. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 75(2), 436-447.

<https://doi.org/10.1093/geronb/gbx162>

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Table 1. Relationship Strain and Support Variables: Measure Descriptions and Descriptive Characteristics

Example Items	Item Response Scale	Relationship Type Assessed	MIDUS Definition ( <i>n</i> <sup>a</sup> )	HRS Definition ( <i>n</i> <sup>a</sup> )	Measures Completed ( <i>n of items</i> <sup>b</sup> )	MIDUS ( <i>N</i> = 755)		HRS ( <i>N</i> = 2585)	
						M ( <i>SD</i> )	$\alpha$	M ( <i>SD</i> )	$\alpha$
<b>Strain measures:</b> “How often do they criticize you?”	<b>MIDUS:</b> 1 ( <i>often</i> ) to 4 ( <i>never</i> )	Family	“Family members not including your spouse or partner” ( <i>n</i> = 666)	“Other immediate family, for example any brothers or sisters, parents, cousins, or grandchildren” who are not coresidential ( <i>n</i> = 977)	Family Strain (4)	2.20(.77)	.774	1.74(.69)	.778
	<b>HRS:</b> 1 ( <i>a lot</i> ) to 4 ( <i>not at all</i> )				Family Support (3)	3.33(.75)	.789	3.10(.82)	.843
<b>Support measures:</b> “How much do they understand the way you feel about things?”	<b>MIDUS &amp; HRS:</b> 1 ( <i>a lot</i> ) to 4 ( <i>not at all</i> )	Intimate Partner	“Spouse or intimate partner” ( <i>n</i> = 342)	“Spouse or coresidential partner” ( <i>n</i> = 524)	IP Strain (4)	2.12(.73)	.758	2.10(.73)	.755
		Child(ren)	--	“All living children” ( <i>n</i> = 889)	IP Support (3)	3.52(.70)	.803	3.25(.77)	.774
					PC Strain (4)	--	--	1.83(.69)	.722
PC Support (3)	--	--	3.30(.74)	.817					

Note: MIDUS = Midlife in the United States, A National Longitudinal Study of Health & Well-Being; HRS = Health and Retirement Study; IP = intimate partner; PC = parent-child. All measures were completed at baseline (i.e., via MIDUS 2/MIDUS 2 Milwaukee’s self-administered questionnaire; or HRS 2006/08’s self-administered Leave-Behind/Participant Lifestyle Questionnaire).

<sup>a</sup>Subsample sizes equal participants who reported having each type of relationship and thus would have completed the measure.

<sup>b</sup>While MIDUS asked an additional item as part of the family support measure, only the equivalent survey items were selected for this study in both MIDUS and HRS to ensure measurement consistency.

Table 2. Participant Reports of Family Relationship Quality Variables, Family Relationship Quality Indices, and Chronic Pain Outcomes: Correlations for MIDUS (N = 755) and HRS (N = 2585)

Variables	1	2	3	4	5	6	7	8	9	10
1. Family Strain	--	-.39**	.30**	-.10	--	--	.93**	-.38**	.10	.04
2. Family Support	-.26**	--	-.12*	.24**	--	--	-.37**	.92**	-.12*	-.22**
3. IP Strain	.33**	-.09**	--	-.53**	--	--	.82**	-.41**	-.03	-.21
4. IP Support	-.19**	.19**	-.32**	--	--	--	.39**	.78**	-.09	.05
5. PC Strain	.63**	-.23**	.45**	-.19**	--	--	--	--	--	--
6. PC Support	-.28**	.48**	-.18**	.31**	-.38**	--	--	--	--	--
7. Average Strain Index	.85**	-.26**	.77**	-.30**	.88**	-.35**	--	-.43**	.09	-.03
8. Average Support Index	-.25**	.83**	-.27**	.69**	-.36**	.82**	-.38**	--	-.12*	-.16
9. Pain Development	.08*	-.01	.08	-.04	.13**	-.04	.11**	-.04	--	--
10. Pain Persistence	.07	-.13*	.06	-.07	.04	-.02	.04	-.13*	--	--

Note: MIDUS = Midlife in the United States, A National Longitudinal Study of Health & Well-Being; HRS = Health and Retirement Study; IP = intimate partner; PC = parent-child. The top triangle of the matrix reports bivariate correlations among MIDUS variables (parent-child strain and parent-child support correlations are absent as these measures are not included in the MIDUS study). The lower triangle of the matrix reports bivariate correlations among HRS variables.

\*\* $p < .01$ ; \* $p < .05$ .

Table 3. Summary of Logistic Regression Analyses for Independent Effects Models: Links Between Observed Family Relationship Quality Variables and Chronic Pain Incidence and Chronic Pain Persistence 10 Years Later for MIDUS (N = 755) and HRS (N = 2585) Samples, Controlling for Sample Characteristics

Models	HRS			MIDUS		
	B(SE)	OR	95% CI	B(SE)	OR	OR 95% CI
<b>Chronic Pain Development</b>						
Model 1: Family Strain	0.24(0.12) <sup>t</sup>	1.27	0.99, 1.63	0.31(0.18) <sup>t</sup>	1.36	0.96, 1.92
Model 2: Family Support	-0.03(0.10)	0.97	0.79, 1.19	-0.40(0.18)*	0.67	0.47, 0.95
Model 3: IP Strain	0.24(0.15)	1.27	0.95, 1.69	-0.19(0.30)	0.83	0.68, 2.16
Model 4: IP Support	-0.08(0.15)	0.92	0.68, 1.24	-0.18(0.31)	0.83	0.46, 1.47
Model 5: PC Strain	0.36(0.13)**	1.43	1.11, 1.84	--	--	--
Model 6: PC Support	-0.18(0.12)	0.83	0.66, 1.05	--	--	--
<b>Chronic Pain Persistence</b>						
Model 1: Family Strain	0.14(0.19)	1.15	0.80, 1.63	-0.03(0.25)	0.97	0.60, 1.58
Model 2: Family Support	-0.30(0.16) <sup>t</sup>	0.74	0.55, 1.00	-0.63(0.27)*	0.53	0.23, 0.92
Model 3: IP Strain	0.12(0.23)	1.12	0.72, 1.76	-0.76(0.42) <sup>t</sup>	0.47	0.21, 1.07
Model 4: IP Support	-0.14(0.20)	0.87	0.59, 1.27	0.22(0.37)	1.24	0.60, 2.59
Model 5: PC Strain	0.08(0.19)	1.09	0.75, 1.58	--	--	--
Model 6: PC Support	-0.01(0.17)	0.98	0.70, 1.38	--	--	--

Note: MIDUS = Midlife in the United States, A National Longitudinal Study of Health & Well-Being; HRS = Health and Retirement Study; IP = intimate partner; PC = parent-child; OR = Odds Ratio. Controls are age, sex, prescription pain medication use, and comorbidities.

\*\* $p < .01$ ; \* $p < .05$ ; <sup>t</sup> $p < .10$

Table 4. Summary of Logistic Regression Analyses for Relationship Type Models: Links Between Observed Family Relationship Quality Variables Within Relationship Types and Chronic Pain Incidence and Chronic Pain Persistence 10 Years Later for MIDUS ( $N = 755$ ) and HRS ( $N = 2585$ ) Samples, Controlling for Sample Characteristics

Models	HRS			MIDUS		
	B(SE)	OR	95% CI	B(SE)	OR	OR 95% CI
<b>Chronic Pain Development</b>						
<b>Model 1 – Family</b>						
Family Strain	0.26(0.13) <sup>†</sup>	1.29	0.99, 1.67	0.17(0.20)	1.18	0.81, 1.73
Family Support	0.05(0.11)	1.06	0.84, 1.32	-0.33(0.20)	0.72	0.49, 1.07
<b>Model 2 – Intimate Partner</b>						
IP Strain	0.30(0.17) <sup>†</sup>	1.36	0.98, 1.88	-0.44(0.37)	0.64	0.32, 1.32
IP Support	0.08(0.18)	1.08	0.76, 1.54	-0.46(0.39)	0.24	0.29, 1.35
<b>Model 3 – Parent-Child</b>						
PC Strain	0.37(0.14)*	1.44	1.09, 1.91	--	--	--
PC Support	0.01(0.14)	1.01	0.78, 1.32	--	--	--
<b>Chronic Pain Persistence</b>						
<b>Model 1 – Family</b>						
Family Strain	-0.24(0.16)	1.10	0.76, 1.08	-0.15(0.26)	0.86	0.51, 1.45
Family Support	0.09(0.19)	0.78	0.57, 1.60	-0.65(0.28)*	0.52	0.30, 0.90
<b>Model 2 – Intimate Partner</b>						
IP Strain	-0.08(0.20)	1.12	0.71, 1.79	-1.24(0.67) <sup>†</sup>	0.29	0.08, 1.08
IP Support	0.17(0.24)	0.92	0.62, 0.36	-0.67(0.61)	0.51	0.15, 1.71
<b>Model 3 – Parent-Child</b>						
PC Strain	0.09(0.20)	1.09	0.73, 1.63	--	--	--
PC Support	0.03(0.19)	1.03	0.71, 1.48	--	--	--

Note: MIDUS = Midlife in the United States, A National Longitudinal Study of Health & Well-Being; HRS = Health and Retirement Study; IP = intimate partner; PC = parent-child; OR = Odds Ratio. Controls are age, sex, prescription pain medication use, and comorbidities.

\* $p < .05$ ; <sup>†</sup> $p < .10$

Table 5. Summary of Logistic Regression Analyses for Relationship Index Models: Links Between Average Support and Average Strain Indices and Chronic Pain Incidence and Chronic Pain Persistence 10 Years Later for MIDUS (N = 755) and HRS (N = 2585) Samples, Controlling for Sample Characteristics

Models	HRS			MIDUS		
	B(SE)	OR	95% CI	B(SE)	OR	OR 95% CI
<b>Chronic Pain Development</b>						
<b>Model 1</b>						
Average Strain	0.39(0.14)*	1.47	1.12, 1.94	0.29(0.19)	1.34	0.92, 1.94
<b>Model 2</b>						
Average Support	-0.15(0.13)	0.86	0.66, 1.12	-0.41(0.19)*	0.67	0.45, 0.98
<b>Model 3</b>						
Average Strain	0.40(0.15)**	1.49	1.20, 2.02	0.14(0.21)	1.15	0.76, 1.74
Average Support	0.02(0.15)	1.02	0.76, 1.37	-0.34(0.22)	0.71	0.46, 1.10
<b>Chronic Pain Persistence</b>						
<b>Model 1</b>						
Average Strain	0.06(0.20)	1.06	0.72, 1.56	-0.26(0.27)	0.77	0.45, 1.32
<b>Model 2</b>						
Average Support	-0.40(0.19)*	0.67	0.47, 0.97	-0.42(0.28)	0.65	0.38, 1.12
<b>Model 3</b>						
Average Strain	-0.08(0.21)	0.92	0.61, 1.39	-0.44(0.31)	0.64	0.35, 1.18
Average Support	-0.42(0.20)*	0.66	0.45, 0.97	-0.56(0.31) <sup>†</sup>	0.57	0.31, 1.04

Note: MIDUS = Midlife in the United States, A National Longitudinal Study of Health & Well-Being; HRS = Health and Retirement Study; OR = Odds Ratio. Controls are age, sex, prescription pain medication use, and comorbidities.

\*\* $p < .01$ ; \* $p < .05$ ; <sup>†</sup> $p < .10$